# Electrical World

MAY 26, 1945

Nature's Storage for Flood Control

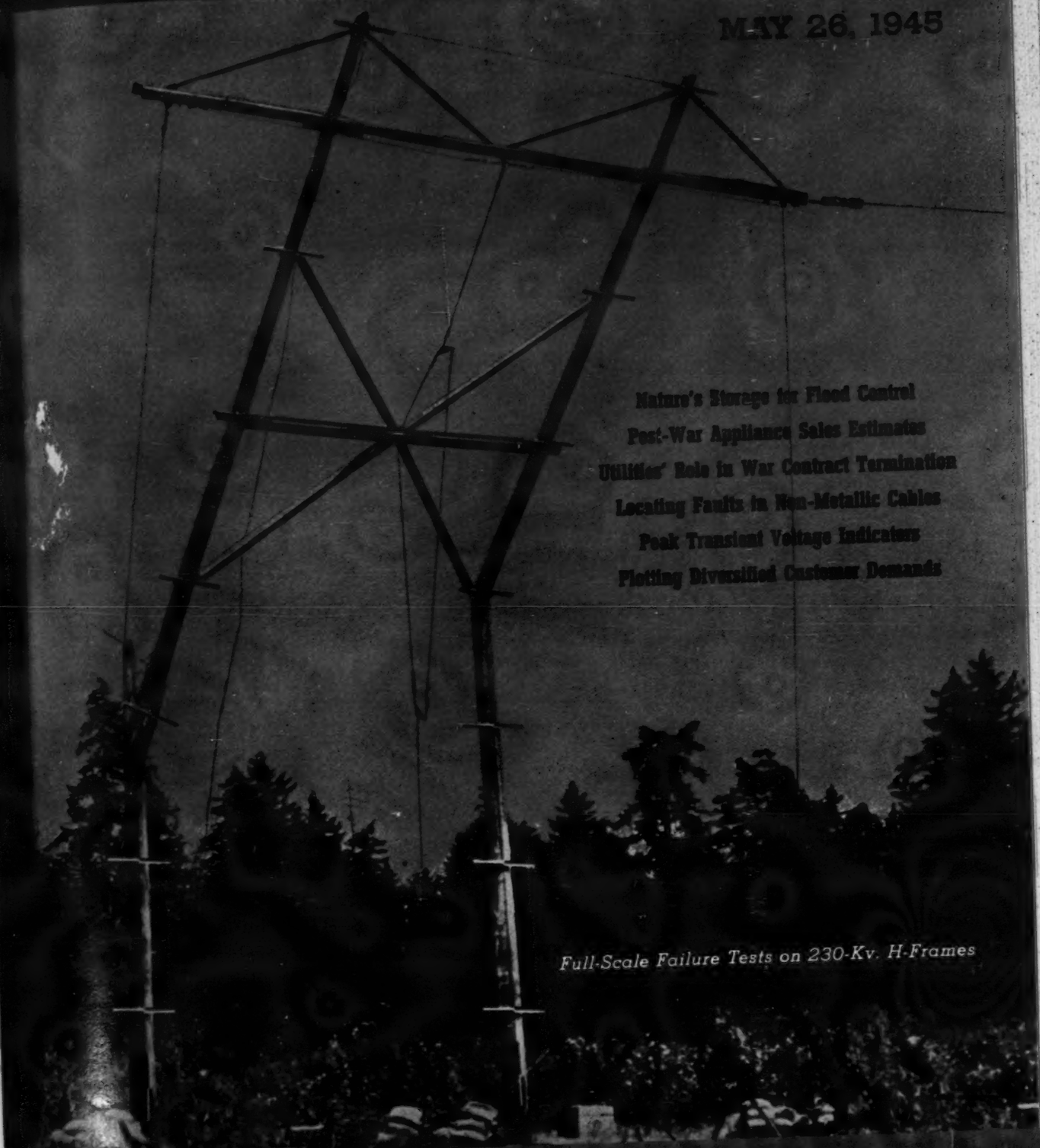
Post-War Appliance Sales Estimates

Utilities' Role in War Contract Termination

Locating Faults in Non-Metallic Cables

Peak Transient Voltage Indicators

Plotting Diversified Customer Demands



*Full-Scale Failure Tests on 230-Kv. H-Frames*

# Now ACCURACY IN RUGGED MOVING IRO
# VANE AND DYNAMOMETER INSTRUMENT

OVER THIS ENTIRE FREQUENCY RANGE

25 ~~~

May 26, 1945 Vol. 123, No. 21

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● *Skimming over forests, jungles or open country . . . hurdling mountains, valleys, rivers, our Army Air Forces can lay combat telephone wire (Okonite plants make thousands of miles a month) at speeds up to 110 miles an hour. Using equipment developed by the Signal Corps, two continuous five-mile circuits can be paid out during a single flight of a light "grasshopper" plane.*

# but here's where *OUR* speed counts

● At home the 7th War Loan is on . . . one mighty effort instead of the two we had up to this time last year . . . a challenge to all of us in industry to get quickly and solidly behind our local bond drive.

Sure — it's a big job to top our quota. Everything about this war is big including our responsibility to those in uniform. Our fighters are depending on us at home to put our job over. It's the least we can do for them — and the War Bond purchase window is the place where your speed counts most now.

## OKONITE

**insulated wires and cables including combat wire**

The Okonite Company, Passaic, N. J. • Okonite-Callender Cable Co., Inc., Paterson, N. J. • Hazard Insulated Wire Works Div., Wilkes-Barre, Pa.

4081

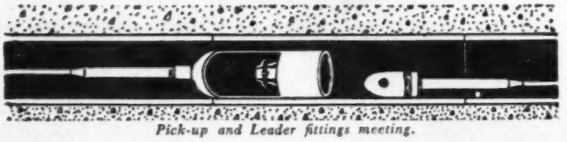
**Utilities have found that one gang, with Electroline Steel Duct-Rodding Equipment, can make a half-hour job out of one that formerly took two gangs two weeks with old-style equipment!**

**In consequence, they have made amazing savings in labor cost alone. Add to this lower first cost, the lower handling cost, and longer life . . . then you have their reason for adopting Electroline's speedy, economical Duct-Rodding Equipment.**

**The construction is simple and trouble-free, yet affords the outstanding advantages of easy, efficient rodding and great durability in service.**

**You can turn days into minutes, too—by speeding up installation and cutting costs with Electroline Duct-Rodding Equipment. Get full details and prices . . . write for a copy of descriptive Bulletin 939.**

**Thirty minutes or two weeks ?**

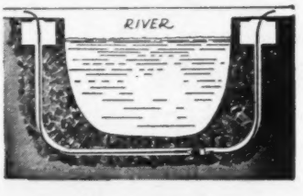


*Pick-up and Leader fittings meeting.*

*Right, Electroline Steel Rodding Equipment feeds easily around the bends.*

*Below, Leader locked in Pick-up for either push or pull.*

PATENT APPLIED FOR




**Electroline Company**

4121 SOUTH LASALLE STREET
CHICAGO, ILLINOIS

# HALT - TO CORROSION!

This unusual night scene shows a 300,000 lb-per-hr Elliott deaerating heater at the Harvey Couch Station of the Arkansas Power & Light Company. The deaerating heater, visible from any point, is a striking symbol of the plant's modernity.

**LIKE A SENTINEL,** against the sky, stands the Elliott deaerating heater. It *is* a sentinel, for its unceasing purpose is to guard the plant by removal of corrosion-causing oxygen from boiler feedwater. It protects boiler tubes, piping, valves, pumps — all water-handling equipment. And while giving this protection, it also provides feedwater heated to the temperature of saturated steam. Night and day this process goes on, quietly, automatically, with no fuss or trouble.

Thousands of plants large and small have used deaeration since Elliott engineers pioneered its development some years ago. This pioneering is still going on — in more and more efficient and economical applications, in the closer fitting of Elliott deaerating heaters to specific conditions. You will find it interesting to discuss your deaeration problem with Elliott engineers.

**ELLIOTT COMPANY, DEAERATOR & HEATER DEPT., JEANNETTE, PA.**
*Plants at* JEANNETTE, PA. • RIDGWAY, PA. • SPRINGFIELD, O. • NEWARK, N. J.
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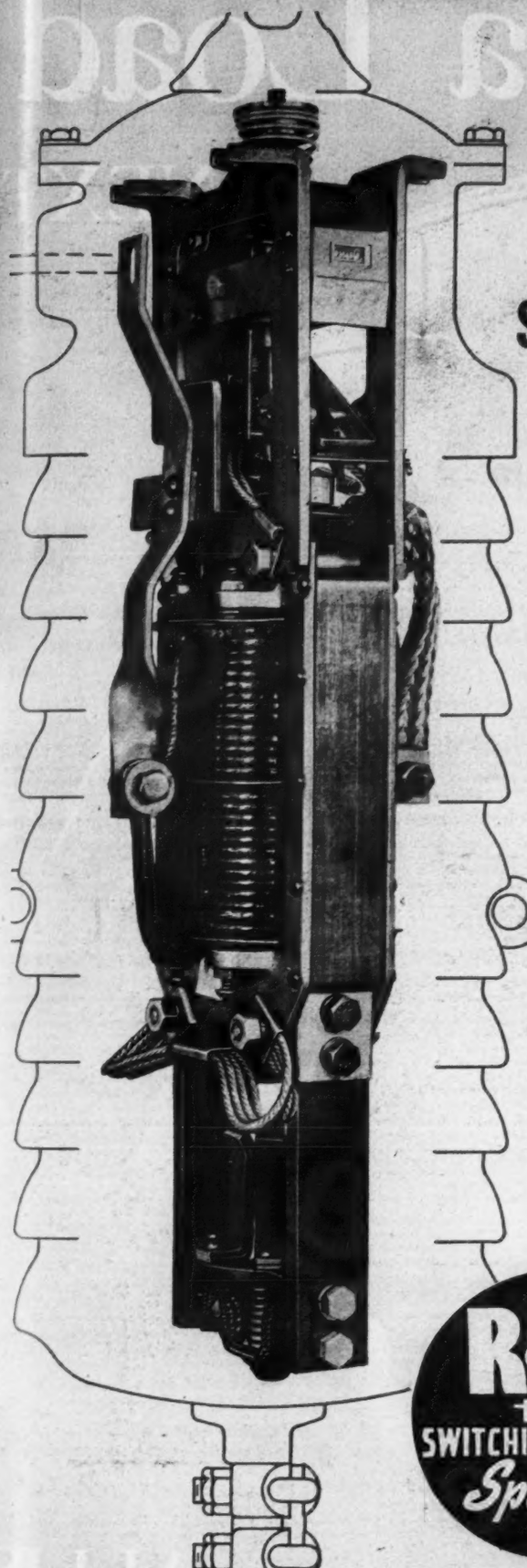
# ELLIOTT DEAERATING FEEDWATER HEATERS



# CHECK the FACTS

## SHORTING CONTACTOR
### Type LSC

**This half cycle, high speed SHORT CIRCUITER reduces the line voltage to zero during faults — extinguishes the arc, forces quick tripping, saves fuses, thereby improving distribution service.**

1. **Controlled short circuit — prevents unnecessary blowing of fuses, permits use of more sectionalizing fuses, confines trouble to faulted phase, limits arc duration to one-half cycle, and prevents burned-down, and other objectionable damage to wires,**
2. **Operates with existing overload protective switchgear.**
3. **Forces quick tripping—brings "tag end" lines into relayed zones.**
4. **Completely automatic—adjustable, mechanical timing to cover necessary time range of lock-out period — no resetting necessary.**

VOLTAGE RATINGS - 7.5, 12.5 KV.
CURRENT RATINGS - 50-100 or 100-200 Amp.
HANDLES FAULTS - up to 5000 Amps.

For complete information write for Bulletin No. 1382

**R&IE** the SWITCHING EQUIPMENT *Specialist*

The Complete Line

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
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- TESTING DEVICES

**RAILWAY AND INDUSTRIAL ENGINEERING COMPANY, GREENSBURG, PA.**

IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

# Take a Load

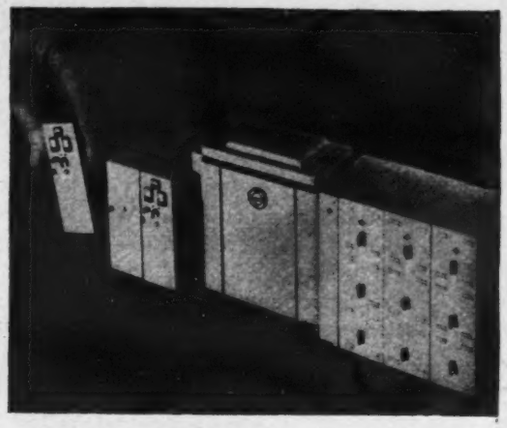
NEXT

ALLIS-

# off Your Mind

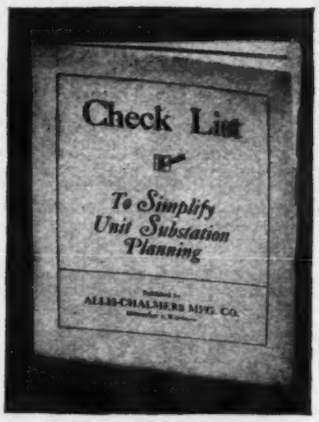
## TIME YOU PLAN UNIT SUBS!

**See how headaches disappear as you work out power distribution problems with Allis-Chalmers' new "Unit Sub Builder" Set! It's no toy, no stunt... but an *engineered* time- and trouble-saver!**



**1** **YOU SEE WHAT'S AVAILABLE** — without bogging down in charts, tables, catalogs. For a demonstration of the new unit sub models by an A-C field engineer, call your nearby Allis-Chalmers office. No obligation, of course.

**2** **YOU EXPERIMENT**—Unit sub arrangements are assembled quickly. . . allowing easy comparison of alternate plans. You'll find models idea-stimulating.




**3** **NEW SLIDE RULE** for figuring breaker interrupting capacities will save you time, trouble.

**4** **YOU VISUALIZE SOLUTIONS** to your distribution problems *on the top of your desk.* You see what space the right unit sub will occupy, how it will actually look.

**5** **HANDY "CHECK LIST"** provides a *double* check. Allis-Chalmers, Milwaukee, Wisconsin.

A 1748

SEE YOUR UNIT SUB IDEAS WORKED OUT WITH

# CHALMERS *"Unit Sub Builder" Set*

# The minnow that caught a shark

THERE'S a new kind of fisherman riding our ocean-going ships today, and he trolls for the gamest fish in the ocean . . . torpedoes! His line is a long electric cable. The bait is a super-sensitive hydrophone.

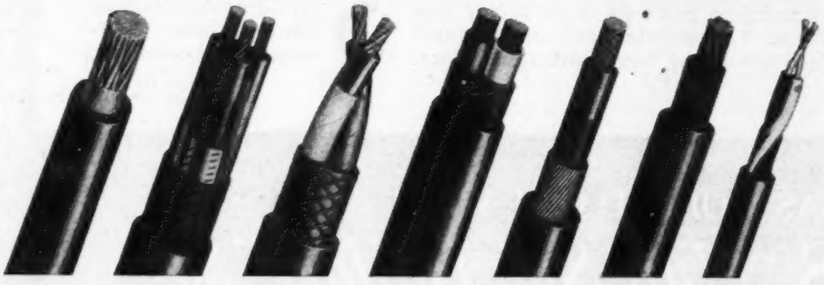
The advantages of a long hydrophone trailing cable are obvious. However, such forces as tensile load, tensile stress, vibration, hydrostatic pressure, corrosion, and water absorption conspired to compound troubles with early cables.

When this serious problem was brought to the attention of the American Steel & Wire Company, a special cable was developed by our engineers which was not only strong, but highly resistant to salt water. What's more, it was shielded against electro-magnetic disturbances that might reduce the hydrophone's effectiveness. The combination of conducting and high strength steel cords resulted in optimum electric and physical characteristics. This U·S·S Amerclad Cable has yielded infinitely better operating life.

In developing this cable the American Steel & Wire Company engineers combined their knowledge to insure satisfactory solutions to the many problems, utilizing the most modern facilities in the company's physical, chemical, and vibration laboratories.

This is the kind of service that is yours for the asking. Almost 95% of all our cable products are tailor-made to meet particular specifications. No matter what kind of cable you need, bring your problems to us. We'll give you a straight answer as to what we can do for you.

AMERCLAD



**BETTER ENGINEERED FOR THE TOUGH JOBS**

**Amerclad is a high-grade, rubber-jacketed, portable cable. It has a wide variety of uses for products ranging from radar, vacuum cleaners, tools and mining machines—to locomotives. It can be dragged over rough, rocky terrain, through mud, oil, or water. It is armored with tough rubber like an automobile tire and can be shielded with semi-conducting rubber against electro-magnetic interference.**

**OTHER PRODUCTS OF AMERICAN STEEL AND WIRE COMPANY**

- Building Wire—Rubber or Synthetic Resin Insulation
- Non-Metallic Sheathed Cable
- Service Entrance and Drop Cable
- Power Cables—Rubber, Varnished Cambric or Paper Insulation
- Armored Submarine or Parkway Cables
- Heatproof Asbestos Insulated Cables
- Weatherproof and Annunciator Wire
- Magnet Wire of all types and sizes
- Galvanized Steel Wire and Strand
- Rural Distribution Conductors

**American Steel & Wire Company**

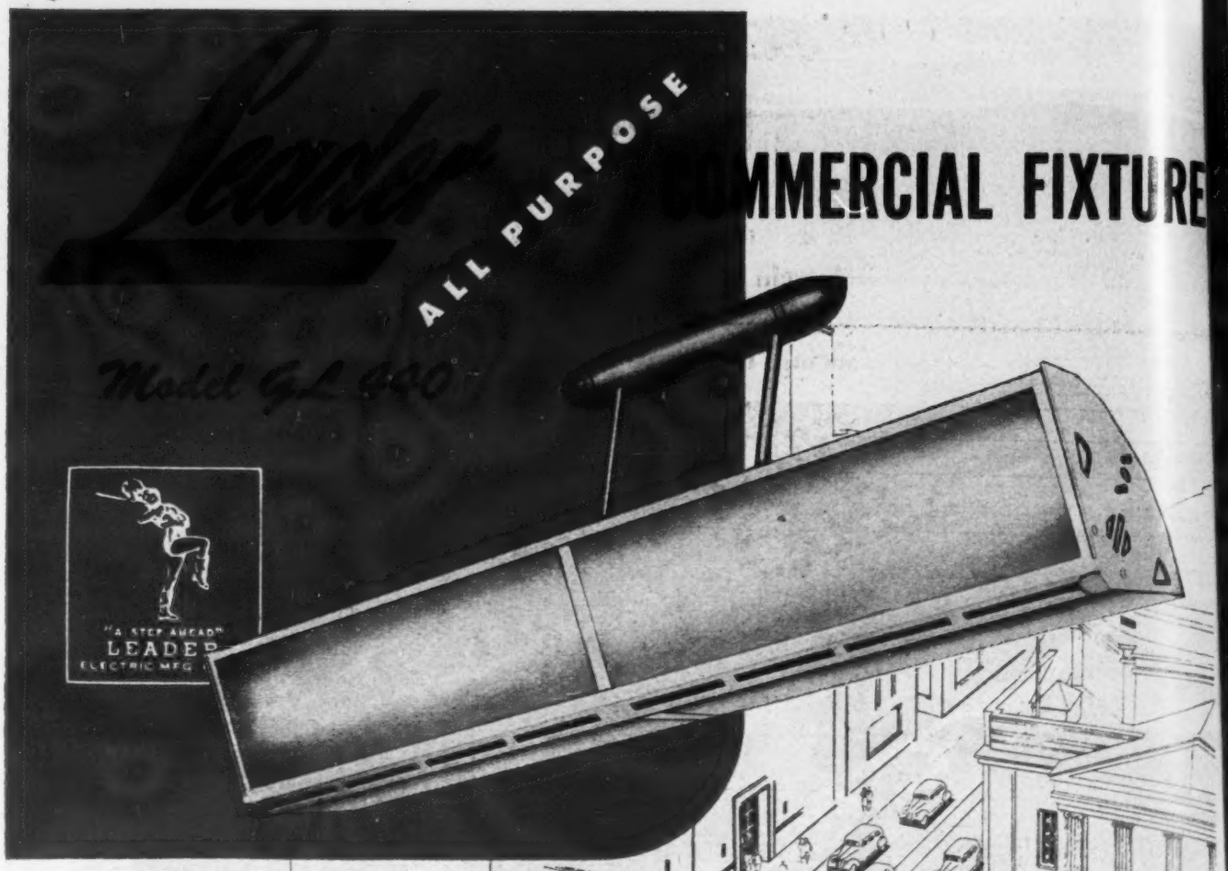
*Cleveland, Chicago and New York*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

**UNITED STATES STEEL**

AMERICAN STEEL & WIRE COMPANY · USS STEEL · UNITED STATES STEEL

# U·S·S AMERCLAD CABLE




# MMERCIAL FIXTURE

## a fluorescent fixture for *Main Street*

Designed for offices, stores, institutions . . . from Main Street to Broadway.

The Leader GL 440 is adaptable to a wide variety of installations, particularly, offices, drafting rooms, schools, stores, banks and other institutions.

A four light glass enclosed unit with a simple concise design, the Leader GL 440 lends itself to modern trends in architecture and lighting.

A hinged panel with snap fasteners is provided to facilitate relamping and servicing. Easy to install either in individual or in continuous run, flush mounted or hung from stems and canopies.

Distributed only through the better electrical wholesalers.

★ post war lighting *Now!*

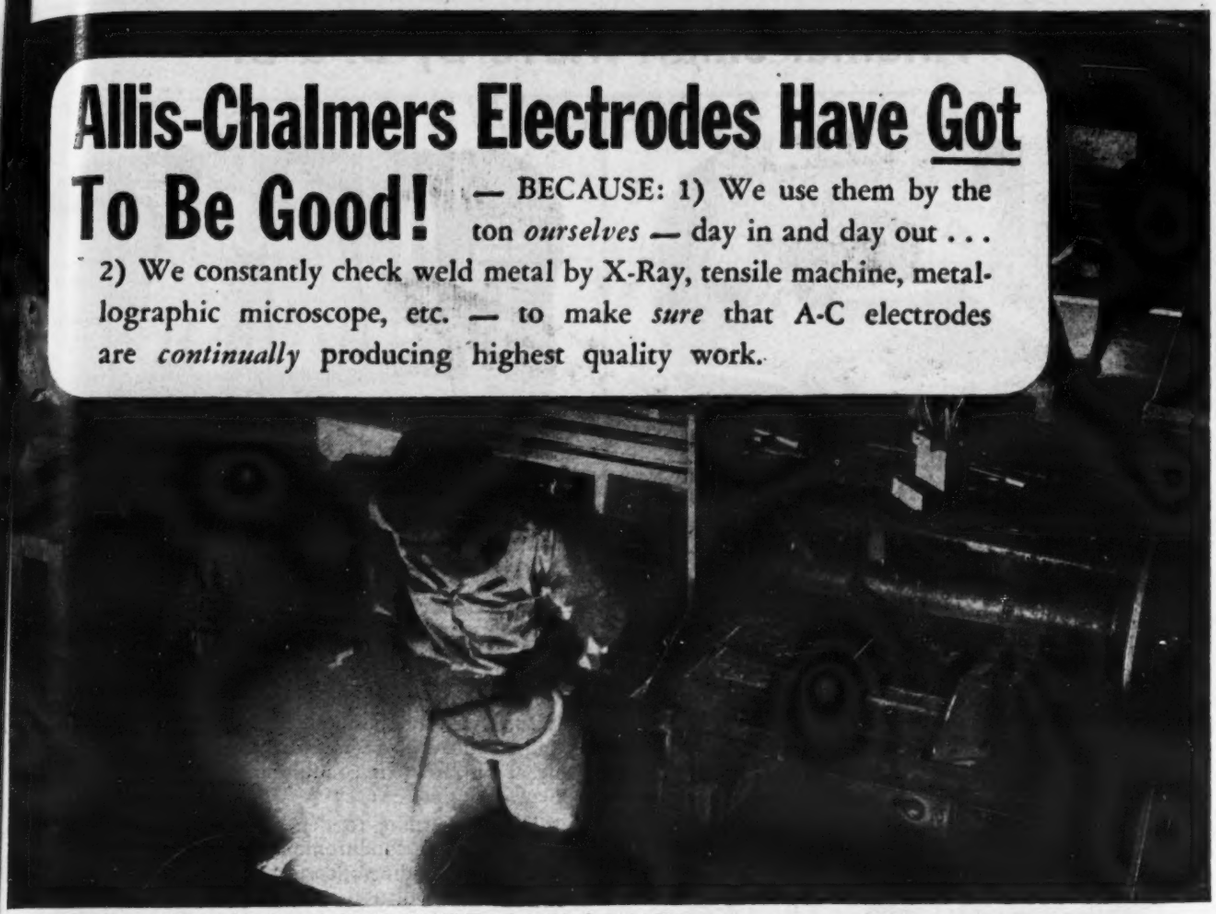
There is a Leader representative in your area

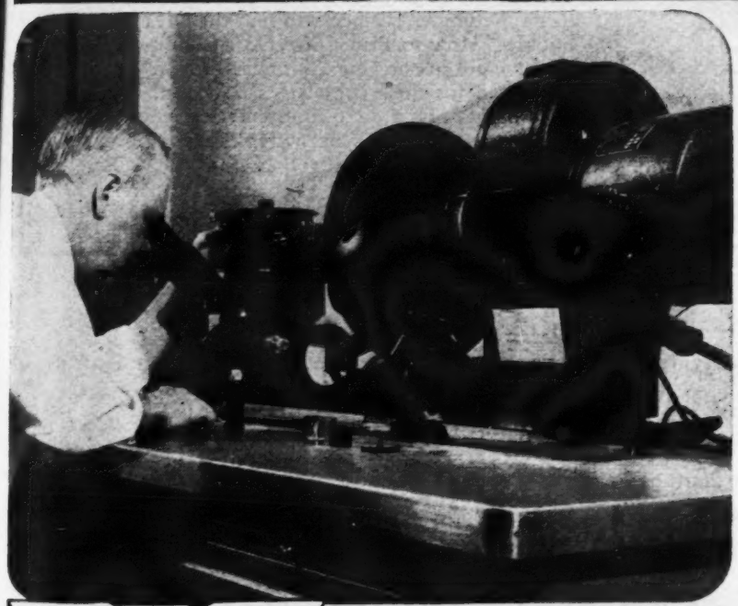
*Leader Electric Manufacturing Corp.*

6127 North Broadway, Chicago 40, Illinois
West Coast Factory:
2040 Livingston Street • Oakland 6, California

# Allis-Chalmers Electrodes Have Got To Be Good!

— BECAUSE: 1) We use them by the ton *ourselves* — day in and day out . . . 2) We constantly check weld metal by X-Ray, tensile machine, metallographic microscope, etc. — to make *sure* that A-C electrodes are *continually* producing highest quality work.





**1** Allis-Chalmers supplies to industry the world's greatest variety of capital goods—over 1600 types of products. Skilled workmanship by thousands of welding operators plays an important part in that record. And *tons* of Allis-Chalmers electrodes are used every day—in such A-C shops as above—to turn out this massive production. Since A-C's *own* weld production hinges on the uniform quality of these electrodes you can see that *they've got to be good!*

**2** One of the typical tests Allis-Chalmers sample welds undergo is inspection on this metallographic microscope. Minute details can be enlarged up to 12,000 diameters—enabling *accurate* study of weld metal structure. With the constant aid of modern research equipment such as this, Allis-Chalmers makes *sure* that A-C electrodes are *made* right—and *perform* right. Try them on *your* next welding job. Our nearby district office or welder dealer can supply you.

A 1810

ALLIS-CHALMERS, MILWAUKEE 1, WIS.

**A-C Electrodes**
EASY TO REMEMBER
EASY TO BUY
Sold by AWS Number

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ARC WELDING ACCESSORIES

# Another Smart Move by D. & D.

**1** You have heard of Dobbs & Datton,
Ad-men keen from old Manhattan,
Who decided on expansion
To new quarters like a mansion.

**2** Though their search was wide and far
Nothing quite came up to par,
Till at last they made a find —
Just the place they had in mind.

**3** Took one floor — and then a second;
For, as they so wisely reckoned,
They'd outdistance competition
With air in *correct* condition.

Air Conditioning will be a postwar essential to almost every conceivable business. Executives everywhere — your commercial and industrial consumers — are hearing about *correct* air conditioning through advertisements like this.

They're learning to depend upon Westinghouse for correct air conditioning . . . the scientifically-engineered blending of correct temperature, humidity, circulation, ventilation and air cleanliness.

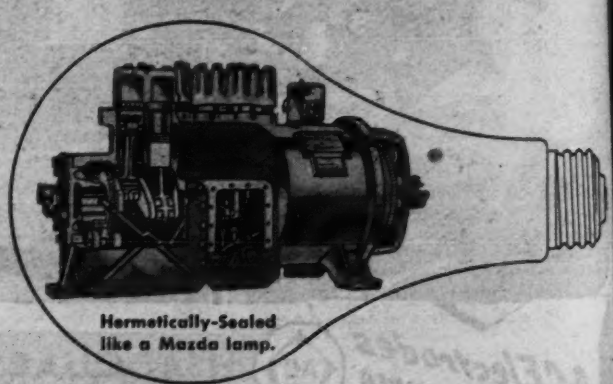
Your commercial men will find the Westinghouse booklet "How to Plan Correct Air Conditioning," a valuable aid in showing consumers how to get what they need for their complete satisfaction. We'll be glad to supply it in quantity. Phone your nearest Westinghouse office or write Westinghouse, 150 Pacific Avenue, Jersey City 4, N. J.

## THE SERVICE-PROVED HERMETICALLY-SEALED COMPRESSOR

**These Westinghouse economy-satisfaction advantages have been proved by years of service in thousands of installations:—**

***No Shaft Seals.*** **During wartime refrigerant shortages, few Westinghouse systems were ever "down." Why? Because seal leaks are the cause of a large percentage of all system failures.**

***Few Parts to Wear . . . Direct-Drive Efficiency . . . Space-Saving Refrigerant-Cooled Motor.***



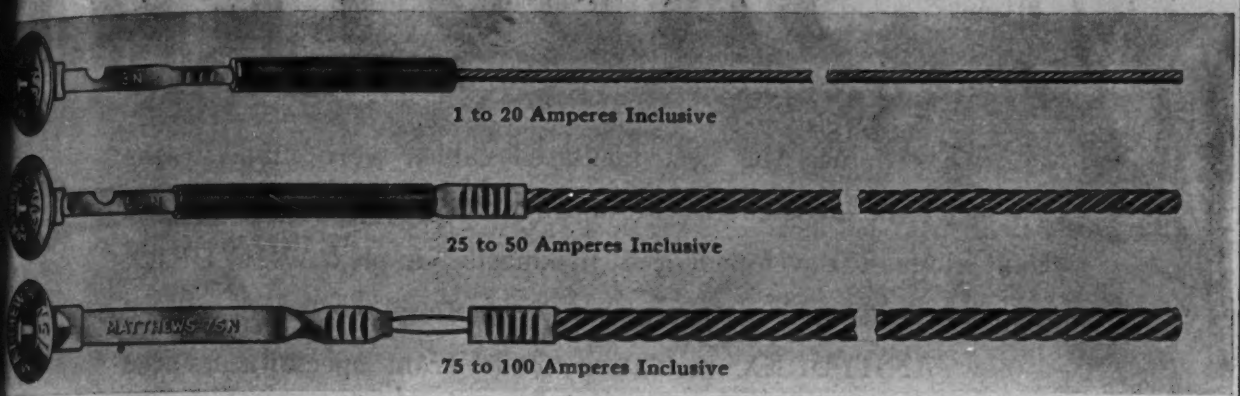
**Hermetically-Sealed like a Mazda lamp.**

# Westinghouse CORRECT Air Conditioning

PLANTS IN 25 CITIES . . OFFICES EVERYWHERE

Westinghouse Presents *John Charles Thomas* • Sunday, 2:30 E.W.T., N.B.C.

# STRONGER AND MORE ACCURATE
# MATTHEWS FUSE LINKS
## SERIES 100-H AND 50-H UNIVERSAL.
## FOR ALL PRIMARY CUTOUTS




1 to 20 Amperes Inclusive

25 to 50 Amperes Inclusive

75 to 100 Amperes Inclusive

## 125—150—175 and 200 AMPERE FUSE LINKS ARE ALSO AVAILABLE

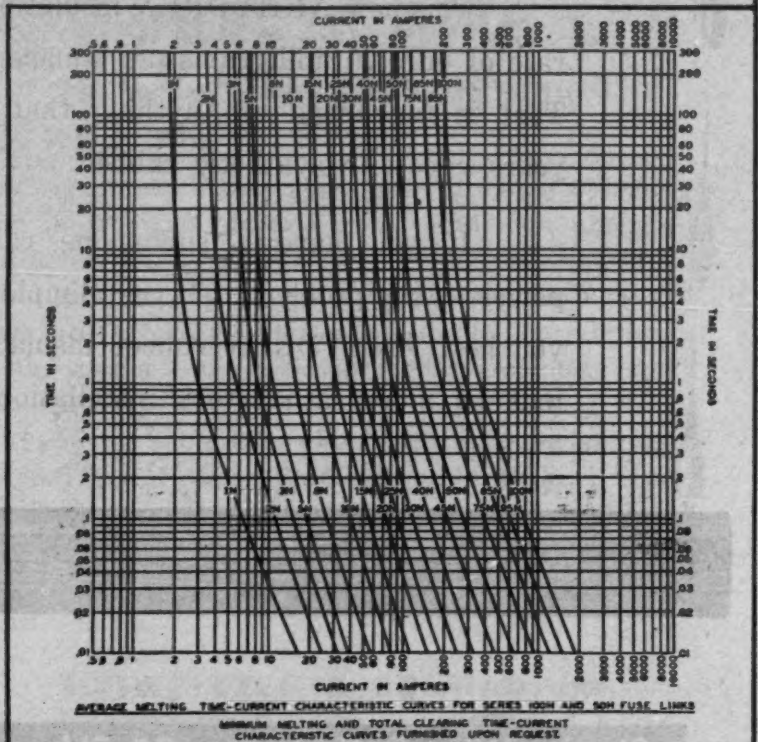
ries 100-H and 50-H Universal Matthews se Links are designed to comply with EMA Standards—Publication 38-53.

Mechanical crimping (rather than soldering parts) insures greater accuracy, uniformity d strength.

The fuse links from ½ to 20 amperes in- usive, are equipped with stainless steel mpression springs to assist in the separa- n of the fusible element. Springs are not ecessary on the fuse links above 20 amperes ecause of the greater expulsion action.

All fusible elements are protected by horn ore tubes. The Series 50-H Fuse Links are quipped with ½ inch diameter cupped fuse eads, while the Series 100-H up to 50 amperes clusive, have in addition, ¾ inch diameter emovable cupped washers. On the sizes bove 50 amperes, ¾ inch diameter cupped use heads are furnished. Flexible copper able is lead coated for greater resistance to orrosion.

They are packed in individual paper tubes, 25 to a telescoping container.


CURRENT IN AMPERES
TIME IN SECONDS
CURRENT IN AMPERES
AVERAGE MELTING TIME-CURRENT CHARACTERISTIC CURVES FOR SERIES 100H AND 50H FUSE LINKS
MINIMUM MELTING AND TOTAL CLEARING TIME-CURRENT CHARACTERISTIC CURVES FURNISHED UPON REQUEST

Full Scale Time Current sheets will be furnished on request

All Matthews Fuse Links comply with NEMA's "N" Standards, and conform to WPB Limitation Order L-154, Schedule 4.

Write for Bulletin 533 for Complete Information.

# W. N. MATTHEWS CORPORATION
SAINT LOUIS, U. S. A.

ENGINEERS and MANUFACTURERS SINCE 1893

# Water is a SABOTEUR

Ever since the first insulated cables were made water has been the arch-enemy of dependable operation. Before the war Simplex developed and produced Simplex-ANHYDREX deproteinized rubber insulation. Now Simplex has developed a new ANHYDREX insulation made from specially treated and compounded Buna rubber.

This new ANHYDREX insulation has a water absorption rate of only 20 milligrams per square inch of exposed surface. That is far ahead of anything that was dreamed of a few years ago with synthetic rubber.

If you have a submarine cable or an underground power cable problem, let the Simplex Sales Engineers show you how ANHYDREX rubber insulation can save money and make a more satisfactory installation for you.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex WIRES and CABLES

"Penicillin for Everybody"
...says Uncle Sam

Release of wonder-drug from exclusive channeling to armed forces steps up demand and production facilities . . . NEWS ITEM

**S&C Load-Interrupter Disconnects**

*Break Load Without Arcing at Main Switch Contacts*

7.5—15 kv . . . 400 AMP.

For loop sectionalizing, isolating transformers . . . feeders, disconnecting capacitors. Combined with Fuses, for substation protection and switching . . . *Bulletin 202-A*

**S&C "SM" Power Fuses**

7.5–34.5 kv, 400/250E Max. Amp.

High interrupting capacity makes them suitable for wide range of applications, providing safe protection on many installations where larger and costlier circuit-interrupting equipment was formerly thought necessary. *Bulletin 200E*

**GET THE DROP ON LIGHTNING OUTAGES**

**"Somafer" Open Cutouts & Reclosers**

7.5—69Kv . . .
50—200 Amp.

Fast, positive terminal separation. Link-position at vent end of tube provides free venting and expulsion of but short length of link-cable. Fuse drops out after arc is cleared. Easily re-fused. *Bulletin 215*

**S&C Universal Fuse Links**

Stronger mechanically . . . no soldered joints. Highly resistant to corrosion and oxidation because of silver current-responsive elements. Capacity to withstand lightning-induced surges and transients. Accurate time-current characteristics. Freedom from needless outages. Fit all makes of cutouts. Longer life . . . less cost. *Bulletin 218-B*

# WAR-VITAL and PEACE-VITAL PLANTS SPECIFY S&C DEVICES

**for modern, reliable LOAD-SWITCHING and Short Circuit Protection**

S&C equipment shown above provides load-switching and short circuit protection in a giant new American Penicillin plant. Packaged within the 3-section cabinet, S&C equipment provides primary metering, control and short circuit protection to a single-phase lighting feeder and a 3-phase power feeder, operating at 15 kv, 400 amp. max.

It pays to know fully about the modern advantages of S&C High Voltage Protective and Switching Equipment.

Check bulletins you'd like (column left) and write; or just place your name and address on this page and mail it to us.

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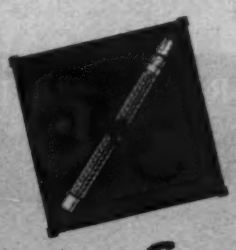
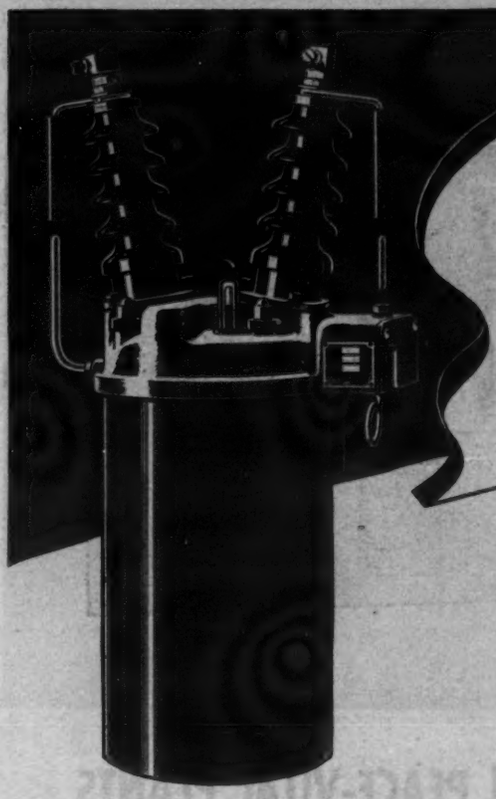
Represented in Principal Cities (Consult Telephone Directory)
In Canada by Powerlite Devices, Ltd., Toronto, Ont.



## LOAD-INTERRUPTER DISCONNECTS and FUSES

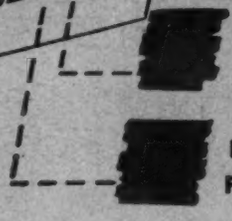
*Experience will choose an S&C Fuse*



...THE TYPE "H"

# KYLE AUTOMATIC OIL CIRCUIT RECLOSER

# LINE TROUBLES A NEW "ONE-TWO



CLEAR ALL TEMPORARY FAULTS AUTOMATICALLY

ISOLATE SECTIONS WHERE PERMANENT FAULTS EXIST

● Line protection afforded by the exclusive dual operating characteristics of Type "H" Kyle Automatic Oil Circuit Reclosers give the improved protection for which operators of long rural distribution lines have been waiting.

Kyle Reclosers bring to such systems a combination of low installation cost, minimum maintenance cost, and a maximum continuity of service that can be secured in no other way.

While Kyle Reclosers, properly designed to coordinate with each other, can be used advantageously at all sectionalizing points, the low revenue of most short branches usually requires inexpensive fuse cutouts at some points.

Kyle Reclosers coordinate with these fuse cutouts to give the maximum continuity of service by:

**1 Fast Opening of the Recloser on the first and second** operations. This allows the temporary fault to be cleared without damage to the fuses.

**2 Time Delay Opening on the third and fourth** operations of the Recloser. This allows the fuse protecting the faulted line to blow. Where a part of a system is protected only by a Recloser, the Recloser isolates the fault by locking out on the fourth operation.

**Ask your Line Material Representative to show you how the proper coordination of Kyle Automatic Oil Circuit Reclosers can best contribute to the increased continuity of service on your lines at lower cost.**

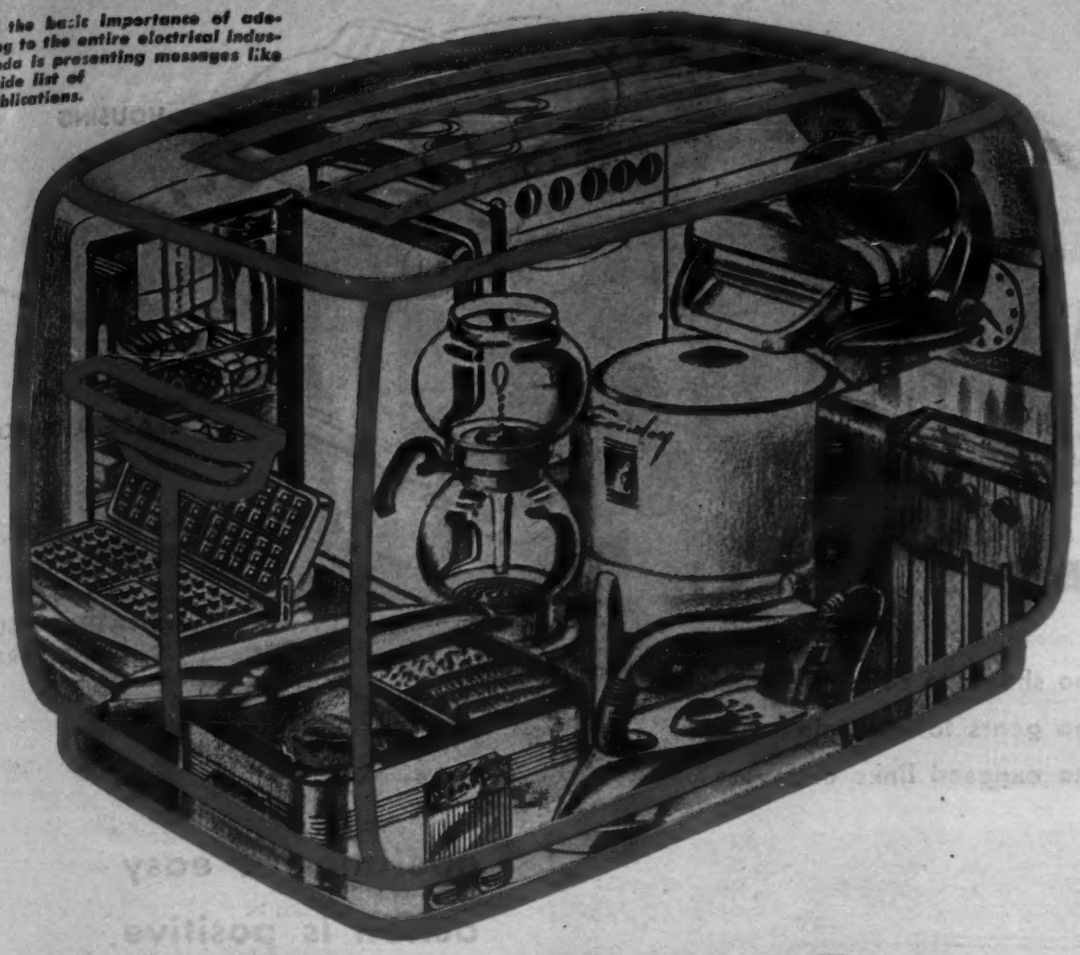
Type "H" Kyle Automatic Oil Circuit Reclosers are enclosed in a steel tank with an aluminum cover. Two conventional porcelain bushings are used so that the line terminals are the only external live parts. Spark gaps are mounted beside each bushing to prevent damage by surge voltage. Operating handle and counter are protected by a hood. The handle is up when the Recloser is closed, down when it is open.
All but the lockout operations are independent of the handle. A steel hanger, welded to the tank, permits single pole mounting and a simple bracket provides for cross arm mounting.

**Ratings of**
**Kyle Oil Circuit Reclosers**

| | |
|---|---|
| Voltage | 2400 to 15,000 |
| Ampere Rating | 5 to 50 |
| Minimum Tripping Current | 10 to 100 Amperes |
| Interrupting Capacity | 150 to 1200 Amperes |

MADE BY KYLE CORPORATION

...use of the basic importance of ade-
...ate wiring to the entire electrical indus-
..., Anaconda is presenting messages like
...s in a wide list of
...ional publications.



## Your electrical future won't stop at a Toaster—

# Don't Risk Postwar WIRE-ITIS*

Now—while you are planning your electrified kitchen—watch out for that coming electrical ill, Wire-itis.

Plan your wiring for full, efficient operation of not just a few, but *all* needed appliances—refrigerator, range, dishwasher, garbage disposer, exhaust fan, and a dozen others. And don't forget ample wiring service for other major improvements, such as air-conditioning, advanced heating, laundry devices, television.

Your electrical contractor *knows* postwar Wire-itis is likely to be costly in expensive alterations. Don't delay—make a point of it to go over your plans with this authority *now!*

Manufacturers! Your electrical plans too may foretell postwar Wire-itis. Before they get out of the blueprint stage talk with your consulting or plant power engineer, electrical contractor or power salesman.

Remember—foresighted wiring will be far cheaper than the "wait and see" kind. 45B00

ANACONDA

*Failure of wiring to meet expanded peacetime needs

## ANACONDA WIRE & CABLE COMPANY

GENERAL OFFICES: 25 Broadway, New York City 4

*Subsidiary of Anaconda Copper Mining Company*

CHICAGO OFFICE: 20 North Wacker Drive 6 • Sales Offices in Principal Cities

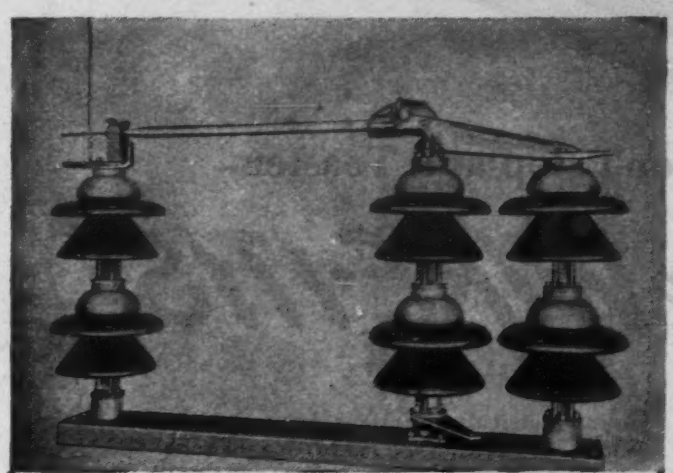
*✓Check Your Wiring Plans Before They Check You!*

ONLY

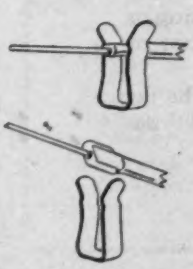
# three

## PARTS MOVE!

- no shunts to corrode or break
- no gears to maintain
- no exposed links or levers



**Break is easy — but contact is always secure**



Special shape of break-jaws helps to lock blade in closed position as further insurance against any movement due to short-circuit current stresses.

## operation is easy
## action is positive
## maintenance . . extremely low

The opening action of the new Westinghouse Type V Outdoor Disconnecting Switch is simple and positive. A groove inside the high-strength copper alloy housing follows the roller cam as it (1) rotates the contact arm, and (2) lifts housing and arm approximately 90 degrees in a vertical arc. That's all.

Operation is easy—even when contacts are sealed by ice or corrosion. Movement is steady and uniform, under positive control at all times. Contact wear is minimized because contact pressure is *completely released* before the vertical lift is initiated.

Ratings range from 7½ to 230 kv, 400 to 2000 amperes. For complete information, write for Booklet B-3480. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60576

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

# TYPE V OUTDOOR DISCONNECTING SWITCH

# America's Foremost Family of Alloys

## T YOUR SERVICE
## FOR 45 YEARS

st proof of the superiority of D/H Alloys lies in record. For 45 years, Driver-Harris has been e foremost producer of an internationally recogzed group of alloys.

Best known member of this famous alloy family NICHROME®—most widely used of all resistance lloys. No less renowned and equally preferred in eir specialized fields are the more than 80 other /H Alloys.

Underlying this preference is the quality plus actor in every D/H Alloy assured by the high egree of metallurgical control that enters into eir manufacture from furnace to spool. Therefore, o insure longer life and improved performance in your product, send your metal specifications to us nd depend on it . . . Driver-Harris will supply the alloy possessing the best electrical and physical properties for your requirements.

D/H

# Driver-Harris COMPANY

**HARRISON, N. J.**

Branches: Chicago · Detroit · Cleveland
Los Angeles · San Francisco · Seattle

ARMY E NAVY

### FOR ELECTRICAL RESISTANCE

NICHROME®
NICHROME® V
ADVANCE®
HYTEMCO®
CHROMAX®
MAGNO®
MIDOHM®
COMET®
LUCERO®
MANGANIN
11 ALLOY
30 OHM ALLOY
LOHM®
90 OHM ALLOY

### FOR HEAT OR CORROSION RESISTANCE

NICHROME®
NICHROME® V
NICKEL A†D†E†Z†
CIMET®
MONEL†
K-MONEL†
R-MONEL†
D/H STAINLESS STEELS
INCONEL†

### FOR RADIO SETS AND TUBES

NICHROME®
NICHROME® V
NICHROME® 111
GRIDNIC A-B-C-D-E-F®
RADIOHM®
MANGANIN
ADVANCE®
52 ALLOY
FILAMENT ALLOYS
D/H STAINLESS STEELS
NICKEL A†D†E†
MONEL†
42 ALLOY
NILVAR®

### FOR SPARK PLUG APPLICATION

MAGNO®
R-63 ALLOY
SPECIAL NICKEL ALLOYS

*In addition to the above gener classifications many other industri are served by Driver-Harris Alloy Space does not permit listing them a*

Trade Mark Reg. U.S. Pat. Off. by Driver-Harris

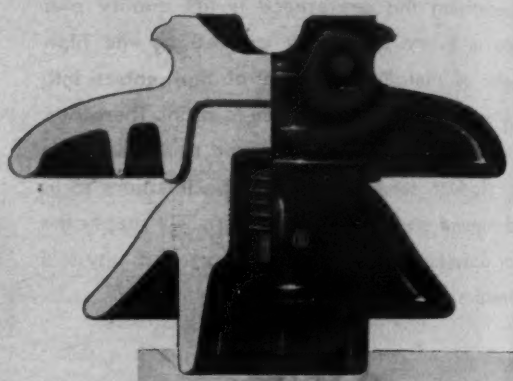
# FARMER JONES ALSO HAS AN INTEREST IN PINTYPES

FARMER Jones isn't impressed by the fine service record of a transmission line fifty miles away, when the power goes off in the middle of his morning milking. It is the performance of low-voltage lines by which your company is judged. These are the Public Relations builders.

Pintype insulators play a vital role here. Cost and maintenance of distribution lines is kept as low as possible. This accounts for the usual absence of ground wires. Individual units of insulation stand alone between potential and ground, fully exposed to the same lightning that is so carefully guarded against in heavier construction. Just think this over and you will have the same respect for pintype insulators that O-B has had for a generation.

Recognition of the importance of pintype insulators, and a willingness to *do something about it,* is an intangible quality of O-B that shows up in the most tangible way--longer life and fewer trouble calls. Isn't this worth getting? Specify O-B pintypes.

2602-H



Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

# MOLONEY CSP*

*COMPLETELY SELF-PROTECTED

# TRANSFORMERS

## Self-Protected Against Damage Resulting From

**1. OVERLOADS**

**2. SHORT CIRCUITS**

**3. LIGHTNING**

EXCESSIVE overloads and secondary short circuits cannot damage Moloney CSP transformers. A thermally-operated secondary circuit breaker automatically disconnects the load from the transformer before the winding temperature approaches the maximum safe value. Advance warning of overloading is given by a warning light provided in the breaker operating handle.

Protection against damage resulting from lightning is provided by "De-ion" gaps in combination with a tank discharge gap. Service continuity is maintained under the most severe lightning conditions.

In addition to these features, Moloney CSP transformers are provided with the same plus values featured in Moloney conventional Type KL and CL transformers including: 1. Ratio adjuster operating handle above hot oil level; 2. Uniformly high impulse strength; 3. High thermal capacity; 4. Core-and-coil unit anchored above oil level.

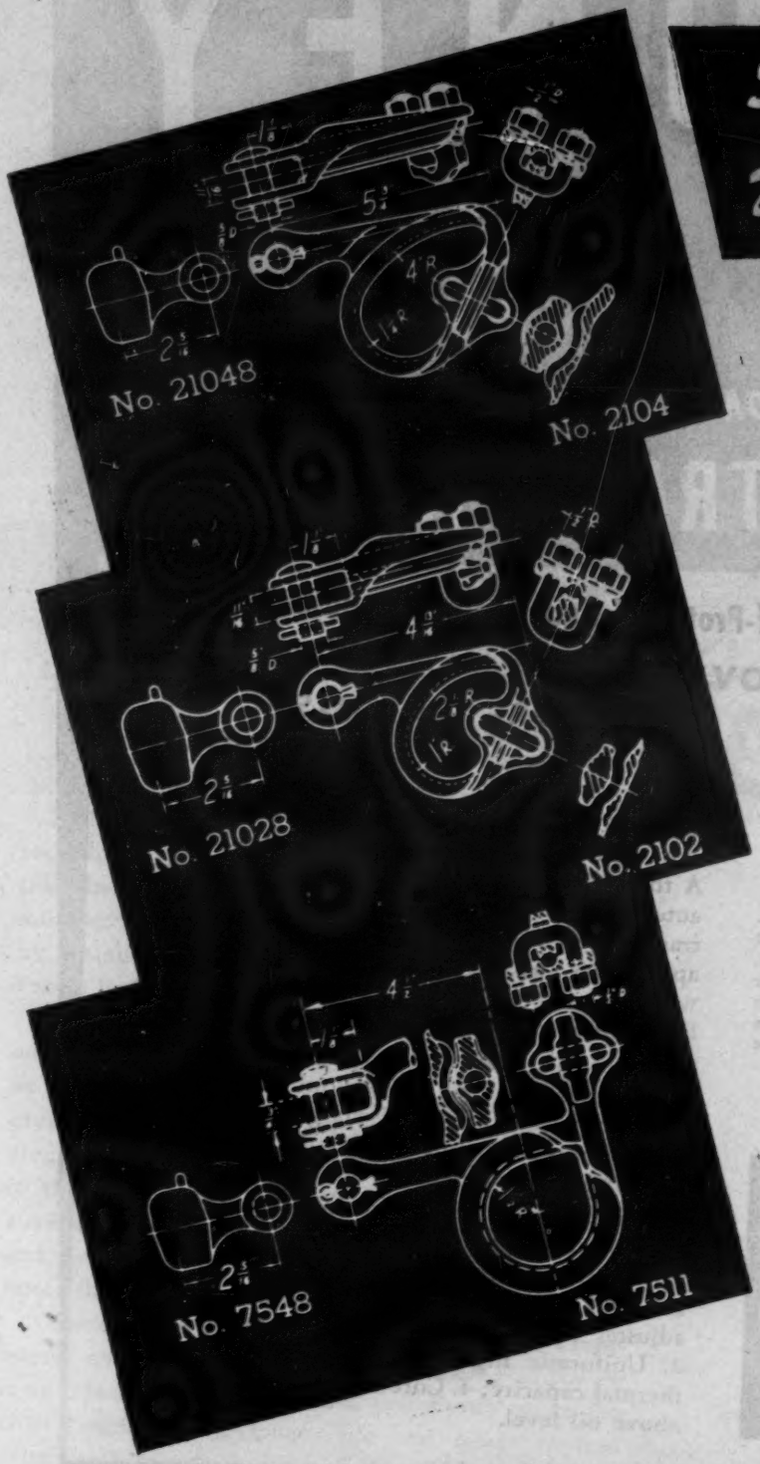
Type TR breaker with warning light contacts. Standard on sizes 5 Kva and larger. Type FR breaker without warning light contacts is standard on 1½ and 3 Kva ratings, but Type TR can be supplied if desired.

Breaker reset handle with built-in warning light. Light goes on when load raises temperature of windings to a dangerous level. Should load continue to increase, the breaker trips. Turning reset handle resets both light and breaker.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U.S.A.

# For Light Transmission Lines

## *Specify Drop Forged Clamps*




**Designed for dead-ending the lighter de transmission and distribution lines – h dreds of thousands of these familiar a accepted snubbing type clamps are in u in all parts of this and other countries and for good reasons . . .**

- **Forged steel gives a light-weight cla of adequate strength.**
- **A short connection length protects t conductor against vibration effect.**
- **Ample radius of snub, smooth cable s and long clamping keeper prev damage to the conductor.**
- **Side opening type is easy to install a work with hot line tools.**
- **Reversible two-groove keepers accom modates a wide range of conduc sizes.**
- **For full detail, write — Engr. Dept. C Div.**

***Through Your Insulator Manufacturer Only***

B-C

## Transmission Line Hardware

**THE BREWER-TITCHENER CORPORATION**
**CORTLAND, NEW YORK**

# PROTECTED BY RUST

In use, Chromel heating elements very soon take on a coating of oxide or rust. This rust acts as a protective coating against progressive oxidation, because it is virtually air tight, and clings very tenaciously to the Chromel alloy. This is one of the good reasons why CHROMEL elements are so remarkably durable.

Chromel is protected by its own rust. For full data, ask for Catalog M.

**RESISTIVITY @ 68°F**

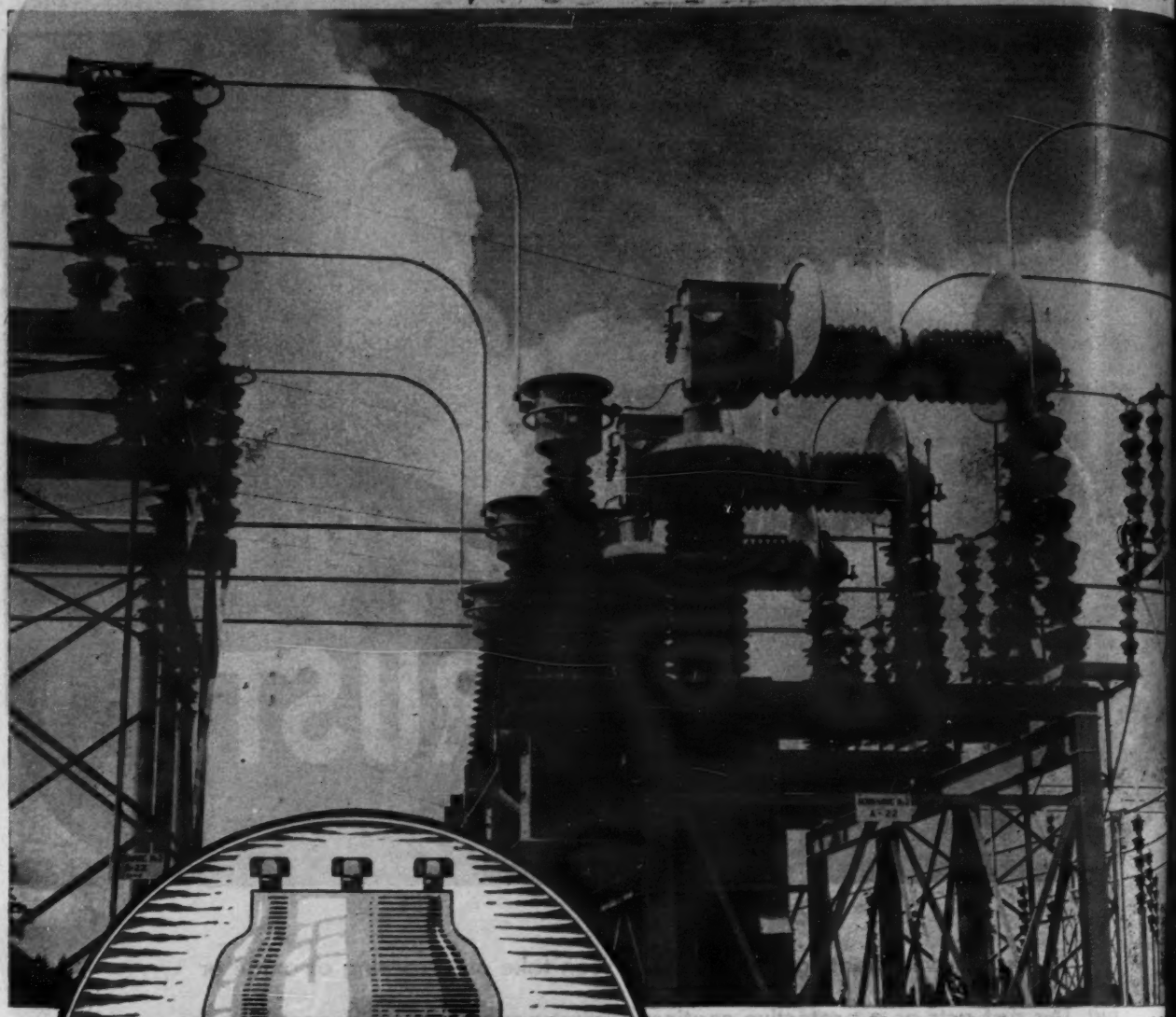
| | WIRE (C. M. Ft.) | RIBBON (Sq. M. Ft.) |
|---|---|---|
| Chromel-A | 650 Ohms | 510 Ohms |
| Chromel-C | 675 Ohms | 530 Ohms |
| Chromel-D | 600 Ohms | 471 Ohms |
| Copel | 294 Ohms | 231 Ohms |

Chromel* NICKEL CHROMIUM
HOSKINS CHROMEL ELECTRICAL HEATING ELEMENT WIRE

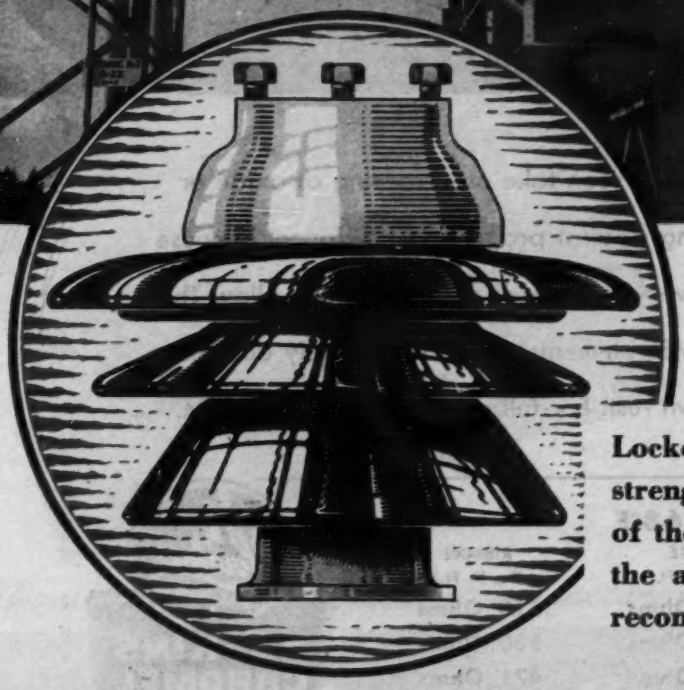
*Used as the heating element in millions of appliances.

**SKINS MANUFACTURING COMPANY, DETROIT 8, MICHIGAN**

# ✓ FOR MAXIMUM



Photograph through courtesy of B
neville Power Administration.



**Locke No. 7785, the original high strength switch type insulator. More of these units have been installed for the applications for which they are recommended than any other unit.**

ORIGINATOR AND LARGEST MANUFACTURER OF WET-PROCESS PORCELAIN INSULATO

# LOCKE Insulato

# ACTORS OF SAFETY....

## OTH MECHANICAL AND ELECTRICAL

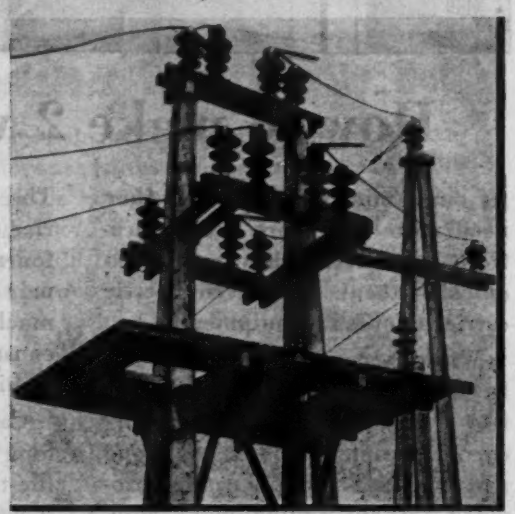
## *Specify* LOCKE SWITCH-TYPE INSULATORS . . .

**Locke switch type insulators have been standard for generations on many of the most important systems of the world because time has proved their superiority.**

**Today, more than ever, the name Locke on your switch insulator means longer, more satisfactory service because:**

1. **The patented Locke compression glazing increases the resistance to damage from mechanical impacts and immunity to thermal shock.**
2. **The patented Locke compression sand—used in all assembly zones—improves the uniformity and stability of the unit and permits high working or transient loads.**
3. **The rugged design makes handling easier and construction quicker with less danger of breakage during installation or maintenance.**

**All apparatus manufacturers will be glad to furnish these more reliable Locke switch insulators.**



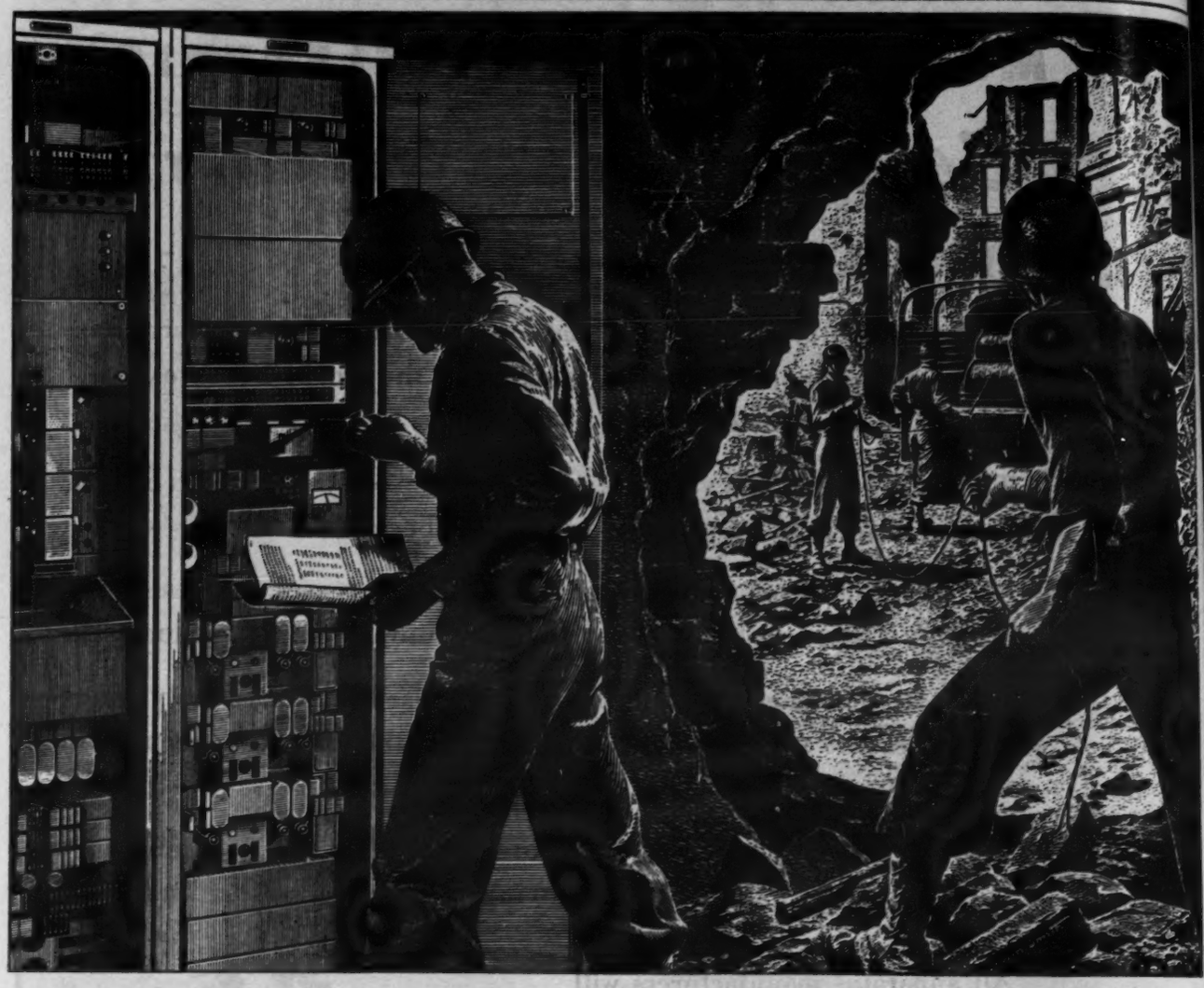
**Locke switch insulators—vintage 1907**

FIFTY PROGRESSIVE YEARS OF SERVICE TO THE ELECTRICAL INDUSTRY

*Corporation* BALTIMORE MARYLAND

## Electrical Weapons by the Maker of Bell Telephones

No. 3 of a series: *for the Signal Corps*



# How to make 2 wires do the war work of 20

As our armies push forward, they need more and more communications channels. They get them *quickly*—thanks to Western Electric carrier telephone equipment.

Without carrier, 2 wires ordinarily carry one telephone and one or two telegraph circuits. By using *carrier* equipment, more telephone and telegraph circuits can be provided without adding more wire. This makes maximum use of existing wires—eliminates the need to manufacture, transport and install thousands of additional miles of wire—saves countless hours in providing vital circuits.

The Army, for example, uses carrier to obtain three telephone and fourteen telegraph circuits over one pair of wires. Even with the use of much carrier equipment, the Army's consumption of wire in France ran as high as 3,000 miles per day.

Carrier telephone equipment has long been made by Western Electric for the Bell System. Army needs, however, differ in many ways from regular telephone requirements.

To meet these wartime conditions, Bell Laboratories engineers designed a revolutionary "packaged" carrier equipment for the Signal Corps. Self-contained, completely wired for quick, easy installation, these units have been produced by Western Electric in vast quantities. On every front, they are speeding our Circuits for Victory!

*During the Seventh War Loan Drive, buy bigger extra War Bonds!*

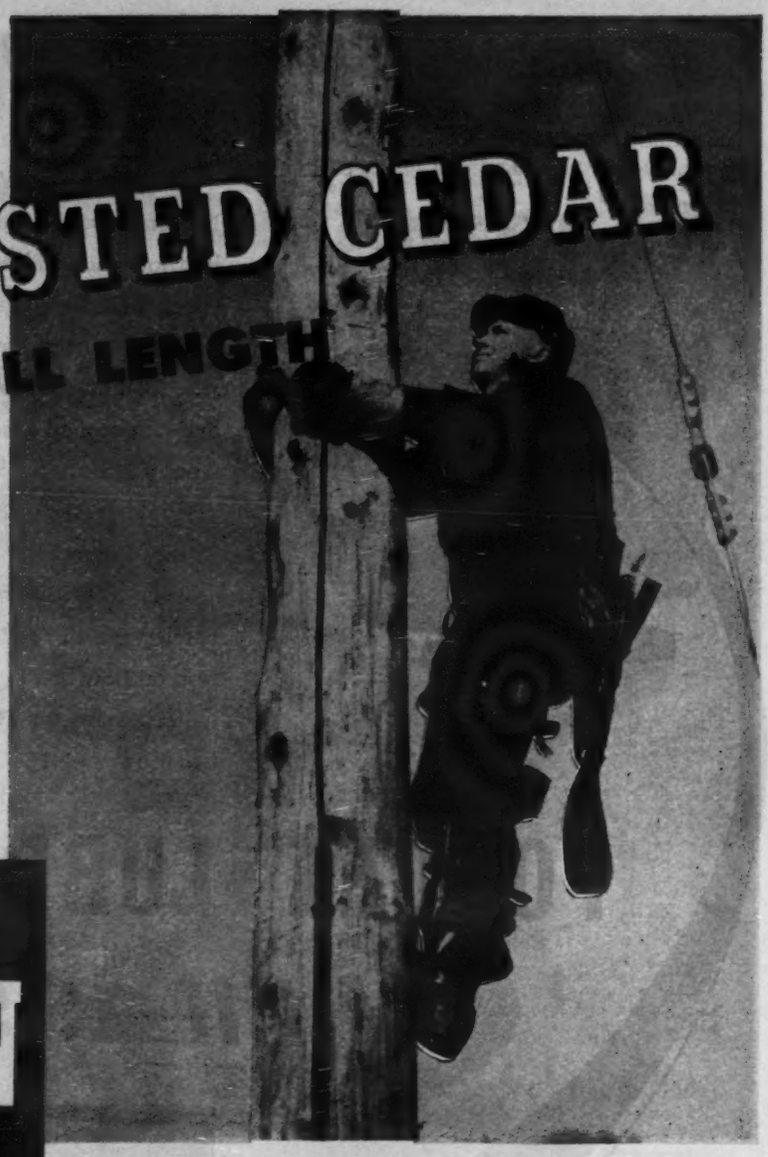
**Western Electric**

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR...ARSENAL OF COMMUNICATIONS EQUIPMENT.

Build with

# TIME-TESTED CEDAR

IMMUNIZED FULL LENGTH



# LIFE-SPAN

*Sold only by the following:*

**NAUGLE POLE & TIE CROP.**
Minneapolis, Minnesota

**PAGE AND HILL CO.**
Minneapolis, Minnesota
50 Church Street, New York, N. Y.

**B. J. CARNEY & CO.**
Spokane • Minneapolis

**SCHAEFER-HITCHCOCK**
Sandpoint, Idaho
Supplies for Joslyn

## Decay Resistant From Top to Butt

Cedar has demonstrated its natural hardiness over long spans of years in the past. Now the naturally long life of cedar has been still farther extended. Through application of a powerful wood preservative, the sapwood in Life Span cedar poles has been given long-term resistance to attacks by fungi and insects. This full-length protective treatment quickly permeates the entire sapwood—brings long-lasting durability to the surface—top to butt! Though fatal to insects and decay organisms—Life-Span's treated poles are harmless to cattle, horses and other farm animals. For strength, for safety, for soundness and long life—specify Life-Span Cedar Poles!

# CONSOLIDATED TREATING CO.

## PRELUBRICATED SEALED BALL BEARINGS...NOW STANDARD ON TYPE CSP MOTORS UP TO 3 HP

Bought now, Westinghouse Type CSP Prelubricated Motors need no greasing till 1950! Extensively field tested in thousands of textile motor applications, the prelubricated ball bearings in Westinghouse Type CSP general-purpose motors have proved they can operate five years . . . 24 hours a day . . . without greasing. Overgreasing and consequent grease seepage into windings is eliminated. One of the major items of induction motor maintenance, periodic greasing, has been reduced to one grease packing job in five years.

Every Westinghouse Type CSP Motor up to 3 hp carries the "Prelubricated" label. For complete information on how the Type CSP Motor can reduce your maintenance, write for D.B. 3100-CSP. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-21317

# FORGET LUBRICATION... *till 1950!*

### ADVANTAGES OF WESTINGHOUSE TYPE CSP PRELUBRICATED MOTORS

- **Prelubricated Sealed Ball Bearings** reduce lubrication maintenance . . . assure longer grease life
- **Improved Tufternoll Insulation**
- **Dynamically Balanced Rotor**
- **Die-cast Rotor** with oversize fan
- **Liberal Through-ventilation**—air enters front, leaves at drive end of motor

**Westinghouse**

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

*Type CSP Motors*

# CON-NEC-TITES

## Save an Extra Connector On Every 2-Way Tap

KEARNEY
No. 4 and No. 6
CON-NEC-TITES
BUILT LONGER TO
HANDLE 3 CONDUCTORS
2-WAY SERVICE
FORMERLY
REQUIRED
2 CONNECTORS
Kearney's strong hexagonal ... provides firm wrench ... ing — prevents slipping.
Kearney's clean threads and correct slot width provide smooth engagement — prevent stripping and binding on conductors.
Kearney's long V-groove surfaces in washer and head assure maximum conductivity and eliminate bent conductors.
Kearney Thread Pilot makes possible easy starting. Elimination of excess threads makes possible easy removal of nut.
Kearney's rounded edges won't cut gloves or nick conductors.

THE majority of 2-way service taps are made on No. 4 and No. 6 conductors. That's why Kearney Forged Con-Nec-Tites are made longer in these sizes — to handle three wires — to save an extra connector on every 2-way tap. As a result, Kearney No. 4 and No. 6 Con-Nec-Tites are real time and money savers.

Other Kearney Con-Nec-Tites from 1,000,000 CM to No. 10 will handle two conductors of any combination of copper, iron, or aluminum.

It will pay you to standardize on the complete line of Kearney Con-Nec-Tites.

*Makers of the Original Split-bolt Solderless Connector*

**JAMES R. KEARNEY CORPORATION**

OVERHEAD **UTILITY EQUIPMENT** UNDERGROUND

2224-42 CLAYTON AVE., ST. LOUIS 10, MO. • CANADIAN PLANT: LEASIDE, ONTARIO

# Serving America's Industrie

TRADE MARK

. . . . . When considering Standard Transformers you naturally want to know where they are now being used, how long they have been in service, what users think of them. We will be glad to have you check these facts with the users—to "ask the man who owns one."

Pictured on the opposite page are a few representative installations of Standard Transformers in industrial and utility service. Naturally we can't begin to show our range of sizes and types in such limited space. But the nearest Standard representative will be glad to give you the complete picture.

Your investigation will quickly convince you that "Standard Transformers" is a good specification always!

## THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO • REPRESENTATIVES IN PRINCIPAL CITIES

*Makers of Transformers for: Distribution..... Power..... Me*

OVER A QUARTER CENTURY OF EXPERIENCE....

This 750 KVA, three phase STANDARD transformer is placed on a load center in a Gonzaga Illinois Steel Corporation mill.

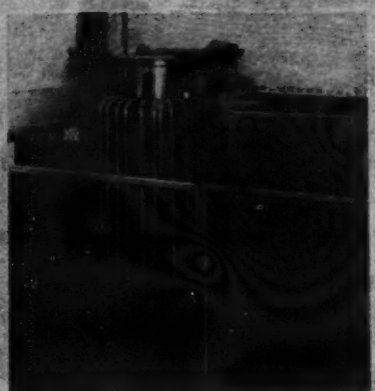
# ital in war and peace

Hygrade-Sylvania lamp plant in Massachusetts has re- d years of dependable service from this 450 KVA in- tion.

STANDARD power transformers give faithful performance in a utility substation in Memphis.

ugh this 5,000 KVA transformer has gone millions of KWH of to help produce vital war supplies manufactured by Graham-Paige.

This 3,000 KVA STANDARD unit substation has supplied power for many years to ships at dock in a West Coast Navy Yard.



One of many indoor installations of STANDARD ASKAREL filled transformers. This one supplies some of the power needed in the manufacture of landing barges.

ighting..... Testing..... Dry and Liquid Filled Types

ALIZING IN DESIGNS TO MEET USERS SPECIFICATIONS

LINE POST LINES
ARE PERMANENTLY RADIO-FREE
In the days when complaints of radio interference constituted the number-one headache to Customer Relations and Transmission Engineering departments, the Lapp Post series of insulators offered the first completely satisfying answer. Radio-free by design—corona cannot form at rated operating voltages and well beyond—Line Posts and Station Posts provide permanent and complete elimination of insulator-generated radio noise.
CUSTOMERS' COMPLAINTS DEPARTMENT
Gone to Florida
1930
1934
1935
1936
1937
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1941
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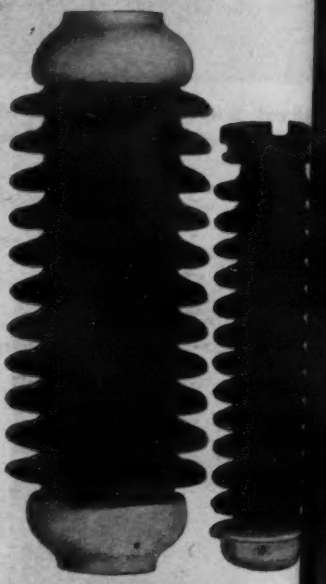
1943
1944
1945

# LAPP LINE POSTS HAVE A 15-YEAR SERVICE RECORD

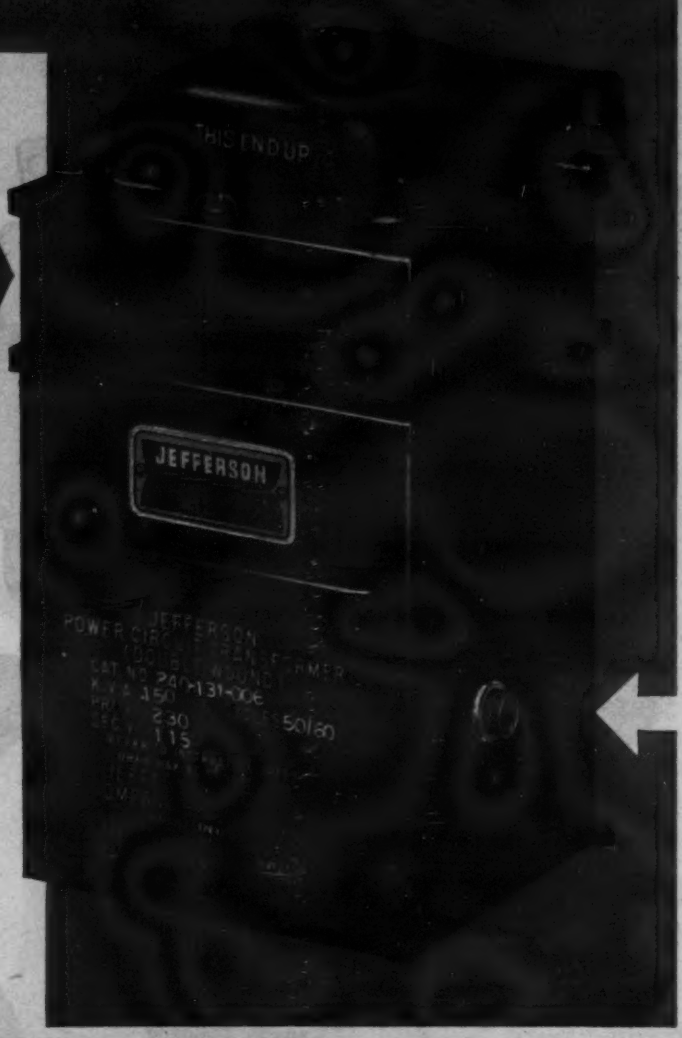


The first shipment of Lapp Line Posts went into service 15 years ago. The installation was the one which had inspired The Line Post design—a particularly bad, and previously unsolved, dirt condition. Since then, hundreds of thousands of Lapp Posts have gone up, in many cases a desperation answer to a difficult service problem—dirt condition, mechanical attack, radio noise, arcover failure. And the 15-year service record of these insulators shows them to stand up better, with fewer line outages, and lower replacement ratio, than any other insulator now in use.

Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N

# POWER CIRCUIT TRANSFORMERS WITH OVERLOAD and SHORT CIRCUIT PROTECTION



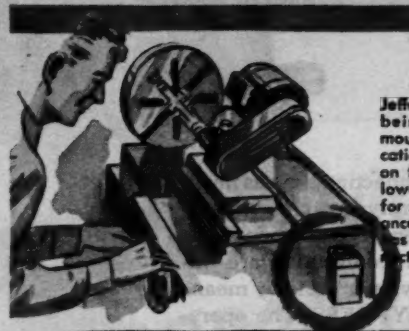

## Safety and Utility

IN ADDITION to providing lower voltage from the higher voltage plant distribution circuits, Jefferson Power Circuit Transformers with built-in Circuit Breakers, give overload and short-circuit protection.

In connection with remote control station, for example as shown in the illustration, these transformers make possible a combination that meets the electrical safety standards of the National Machine Tool Builders Ass'n.

Mounting transformers directly on machinery has come into wide use also where in addition to supplying lower voltage for small electric appliances, localized lighting units are employed as a means of reducing eye fatigue and improving output.

Jefferson Power Circuit Transformers are used in America's leading War goods and essential industrial plants. Chances are you can gain by their use also. Let us have your problem or write today for Bulletin 21-PCT... For your convenience Electrical Wholesalers everywhere carry Jefferson Electric Products... JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. *In Canada:* Canadian Jefferson Electric Co., Ltd., 384 Pape Avenue, Toronto, Ont.

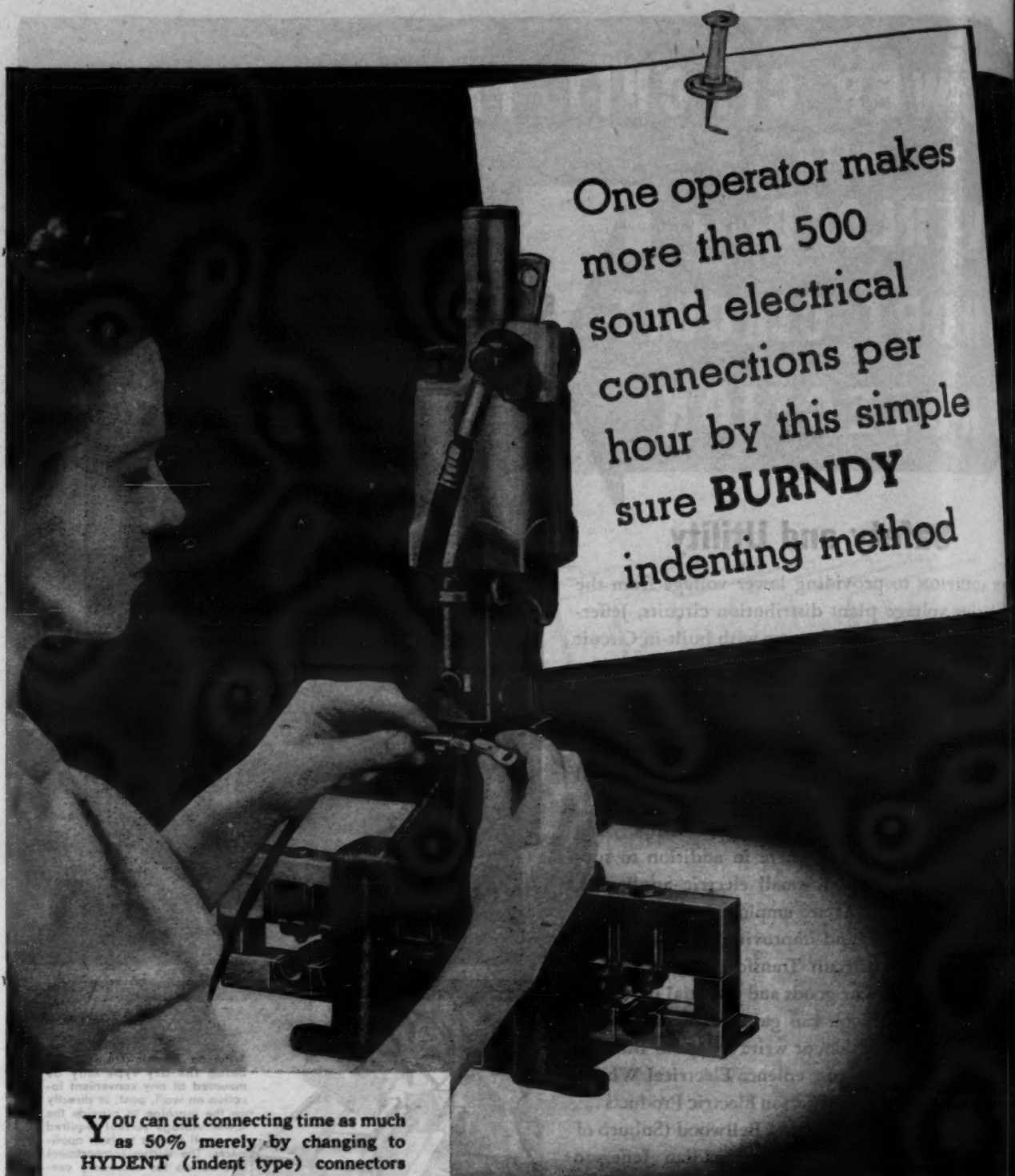


Jefferson Electric Transformers being the dry type may be mounted at any convenient location on wall, post, or directly on the machine to provide the lower voltage current required for small electric tools or appliances. The wiring compartment has outlets for secondary connections.

For close tolerance or special work, many individual machine tools are equipped with separate lamps. Transformers to provide the lower voltage current are mounted on the machine and may be furnished with an "on" and "off" switch, and a receptacle to accommodate lamp-cord attachment plug.

JEFFERSON ELECTRIC

**Power Circuit TRANSFORMERS**




YOU can cut connecting time as much as 50% merely by changing to HYDENT (indent type) connectors These one-piece connectors are *indented* onto the wire or cable by means of the Burndy HYPRESS. The operation is fast and sure—no solder—no flame to damage insulation. HYDENT connections are strong and highly efficient. The HYPRESS—automatic or manually operated—makes a uniformly firm indent that is easily and quickly inspected. Send for literature today, or have Burndy engineers submit costs based on your production needs. Write to Burndy Engineering Co., 107-J Bruckner Blvd., New York 54, N. Y.

*Headquarters for* CONNECTORS

**Burndy**

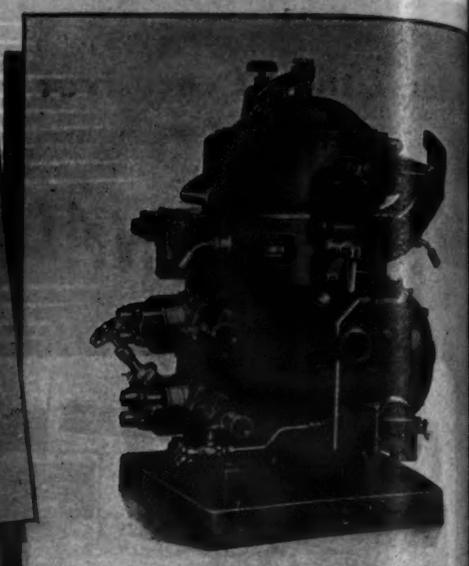
Page after page of national magazine publicity. Column upon column of newspaper stories and editorials — space that couldn't be bought at any price . . .
Thousands of dollars worth of advertising *every month* by The Street and Traffic Safety Lighting Bureau, its member companies, and many well known utilities . . .
Newsletter
A monthly newsletter service . . .
Sample
Direct Mail Campaign
Direct mail folders and window displays . . .

# ARE YOU TAKING ADVANTAGE OF THIS OPPORTUNITY?

**Start *your* program now. If you do not have all the details on this nation-wide campaign, the most ambitious ever undertaken, write The Street Lighting Section of NEMA, 155 E. 44th Street, New York 17, N. Y.**

**GOOD STREET LIGHTING BUILDS GOOD WILL**

# TURBINES and DIESELS ARE ONLY HALF PROTECTED UNLESS BOTH DIRT and WATER are REMOVED from the OIL



***DE LAVAL OIL PURIFIERS*** **afford *full* protection against the principal causes of lubrication failure. They remove the impurities that contaminate oil in service and enable the oil to perform at full efficiency indefinitely. Why?**

***BECAUSE*** – De Laval Oil Purifiers instantaneously, remove by centrifugal force ***both*** of the chief enemies of good lubricating oil performance — ***water*** and ***dirt***. With a De Laval, there is no such thing as doing half the job — the protection to the prime mover is the maximum possible.

In the case of turbo-generating systems, the trouble-maker is usually sludge, and sludge forms fastest when water is present in the oil. De Lavals of proper capacity on continuous by-pass, purifying the oil in circulation three to four times daily, minimize sludge formation.

By removing water more completely from Diesel oil, the De Laval Oil Purifier helps prevent the formation of emulsions with the oil — a fact of especial importance when new heavy types of lubricating oil are used.

Protection from dirt is equally positive. Centrifugal force applied in the De Laval bowl removes any solid impurities more completely and quicker . . . keeps the oil clean and in "like new" condition.

**ADVANTAGES OF DE LAVAL LUBRICATING OIL PURIFIERS**

Maintain oil in condition most nearly identical with that of new oil

•

Provide maximum protection to power units

•

Constant high purifying efficiency—without renewal of functional parts

•

**Remove both enemies of good lubricating oil performance: water and dirt**

•

Economical to operate

•

Give long, trouble-free service

•

Lower maintenance costs

•

Self-draining purifier bowl makes for easy cleaning

# DE LAVAL LUBRICATING OIL PURIFIERS

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

Seyler

# MANUFACTURING COMPANY

Sharpsburg, P. O.

PITTSBURGH, PA., P. O. BOX 7227

May 26, 1945

Transmission and
Distribution Engineers

J.B.W. — Send for this ↙

Gentlemen:

Have you seen our recently published "Comparative Stock Number Lists for Pole Line Hardware and for Construction Specialties?"

From calls on men in the industry we found a need for printed lists, collating the different manufacturers' catalog numbers.

To help your engineers and your men in purchasing and stores we have prepared these two cross-indexed lists, providing complete check charts for all sources of supply for any hardware or specialty item.

These useful lists represent only one more small effort on Seyler's part to serve you better. At the plant we continue to produce more pole line hardware, cooperating with those in our branch of the industry, to supply your essential needs.

Looking forward, Seyler has developed a program, designed to provide the finest possible service for you in the many active years ahead.

Important announcements of interest to you will be made soon.

J.B.W. — Watch Seyler →

Yours sincerely,

Carl Seyler

Carl Seyler

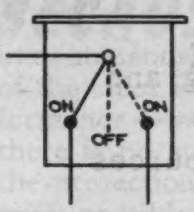
P. S. The Seyler up-to-date handbook and Catalog No. 43 is also available.

*Switch to the other cable!*

**IN CASE OF TROUBLE TRANSFER THE LOAD TO THE EMERGENCY CIRCUIT**

# G & W

## TYPE "RAD" DOUBLE THROW OIL SWITCHES PROVIDE FOR EMERGENCIES




The metal enclosed oil immersed switch contacts are protected against corrosion and deterioration. Also load break is provided without any special features (400 amperes at 4kv., 100 amperes at 13.2 kv.)

The rocker arm operated links have full floating contacts. The stationary contact blades are clamped onto hoodnuts which seal the inside end of the porcelain insulators. *Inspection windows permit viewing the position of the links.*

Cable ends, are permanently sealed in the oil tight unit detachable potheads.

**G & W TYPE "RA" OIL SWITCHES ARE MADE IN A WIDE VARIETY OF FORMS, FOR VOLTAGES UP TO 34.5Kv. THOUSANDS IN SERVICE—TROUBLE-FREE SINCE 1930.**

***Write us or our nearest representative for further data.***

G&W ELECTRIC SPECIALTY CO.
7780 DANTE AVE., CHICAGO 19, ILL., U.S.A.

*Potheads . . . Boxes . . . Oil Fuse Cutouts . . . Oil Switches . . . Multitaps . . . Splicing Kits*

*In Canada—Powerlite Devices, Ltd., Toronto, Canada*

G&W ELECTRIC SPECIALTIES

*Originators and pioneers of equipment for sound methods of underground and overhead electric distribution.*

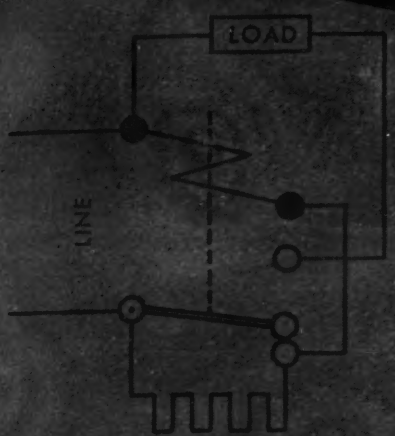
# *Sensitive* SNAP-ACTION

## ...in a new, simplified design

The new, simplified construction of the Struthers-Dunn Type 79XAX Sensitive Snap-Action Relay makes it particularly suitable for a wide range of applications because of its ease of adjustment. Snap-action design assures full normally-closed and normally-open contact pressures. Erratic operations and varying contact resistance encountered with ordinary sensitive relays, due to slowly changing coil flux balancing armature spring tension, are eliminated.

The armature of the 79XAX almost completes its travel in either direction before the contacts snap into the new position. This feature permits an unusually broad range of use from vacuum tube circuits, to overcurrent protection, pulsing circuits, and jobs where extremely close differential or extreme sensitivity of operation is required.

The standard adjustment using 60 ampere turns in the coil at approximately .02 watts results in contact pressures of 5 grams with contacts rated 5 amperes, 115 volts a-c; or 0.5 amperes, 115 volts d-c, non-inductive. Contact ratings up to 10 amperes, 115 volts a-c may be obtained with 100 or more ampere turns and a corresponding increase in power. A sensitivity of 0.005 watts, with 30 ampere turns, is obtainable with reduced contact pressures and ratings, and at an increase in price of the unit.




### A TYPICAL CLOSE DIFFERENTIAL APPLICATION

In using the Struthers-Dunn 79XAX Relay, extremely close differential between pick-up and drop-out may be obtained for potential operation as shown above. The resistor is chosen so that, when the armature closes, the coil current is automatically reduced to a value just sufficient to hold it closed. Any further decrease in voltage will cause the relay to return to its normal de-energized position as shown.

**STRUTHERS-DUNN INCORPORATED**
**1321 ARCH STREET, PHILADELPHIA 7, PA.**

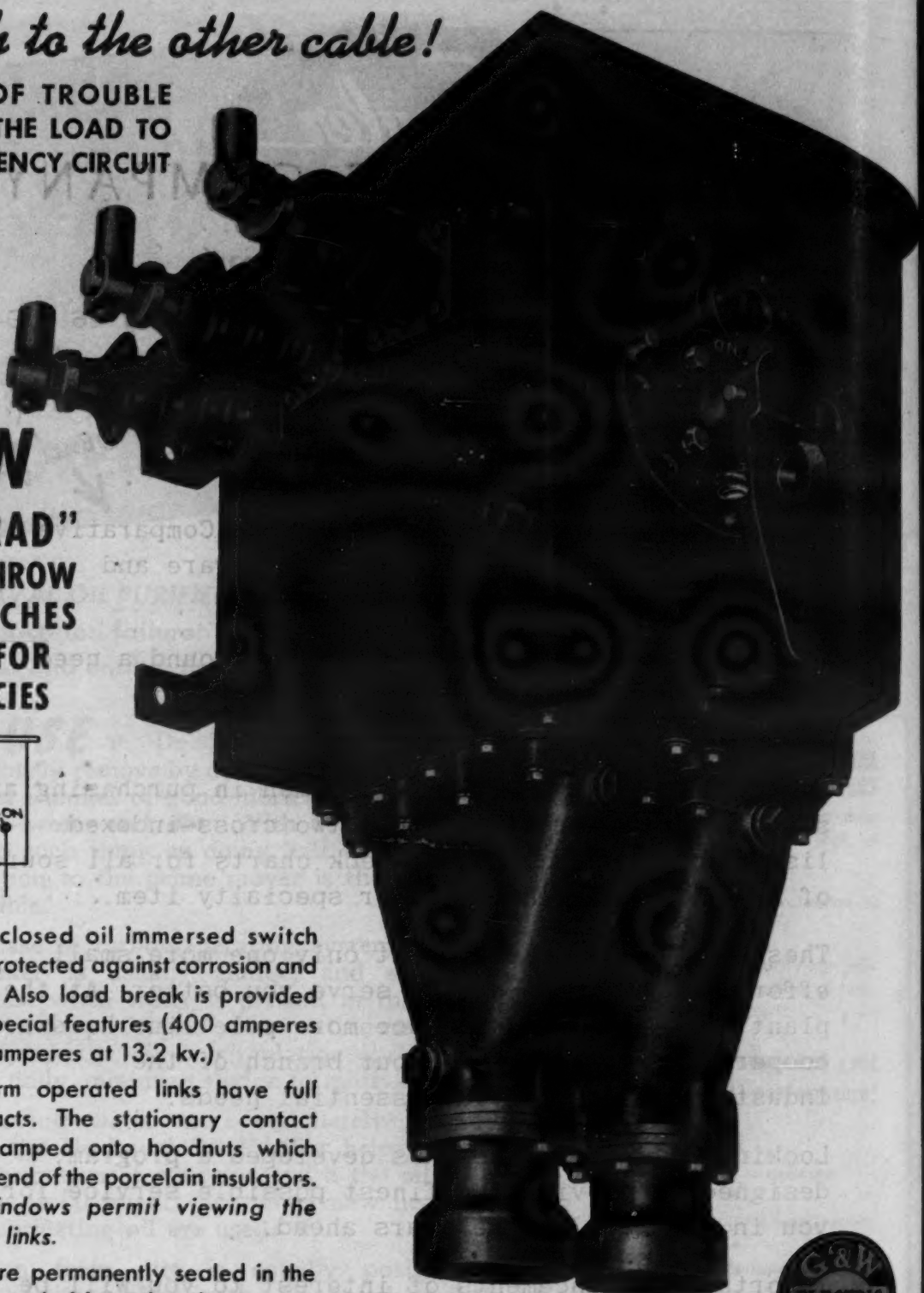
# STRUTHERS-DUNN

## 5,312 RELAY TYPES

DISTRICT ENGINEERING OFFICES: ATLANTA · BALTIMORE · BOSTON · BUFFALO · CHICAGO · CINCINNATI · CLEVELAND
DALLAS · DENVER · DETROIT · HARTFORD · INDIANAPOLIS · LOS ANGELES · MINNEAPOLIS · MONTREAL
NEW YORK · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · SEATTLE · SYRACUSE · TORONTO · WASHINGTON

*Switch to the other cable!*

**IN CASE OF TROUBLE TRANSFER THE LOAD TO THE EMERGENCY CIRCUIT**



# G & W

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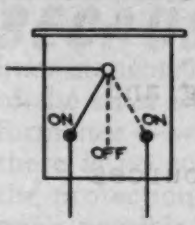


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*Originators and pioneers of equipment for sound methods of underground and overhead electric distribution.*

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*Potheads . . . Boxes . . . Oil Fuse Cutouts . . . Oil Switches . . . Multitaps . . . Splicing Kits*

*In Canada—Powerlite Devices, Ltd., Toronto, Canada*

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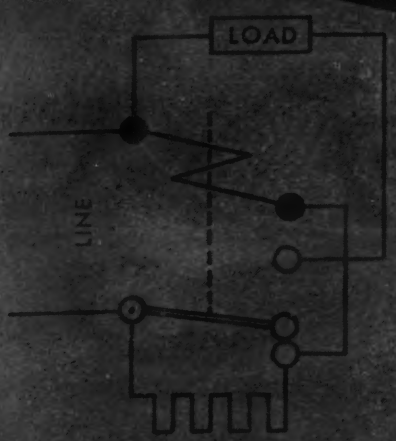


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**STRUTHERS-DUNN INCORPORATED**
**1321 ARCH STREET, PHILADELPHIA 7, PA.**

# STRUTHERS-DUNN

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NEW YORK · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · SEATTLE · SYRACUSE · TORONTO · WASHINGTON

# "LEAD-MOLD CURED"

**PACEMAKER IN WIRE PRODUCTS**

WEATHERPROOF WIRE • SERVICE ENTRANCE CABLES
RUBBER COVERED WIRES AND CABLES (INCLUDING
THIN-WALL INSULATED BUILDING WIRES AND CABLES)
RUBBER SHEATHED PORTABLE CABLES • MAGNET WIRE
TELEPHONE WIRES • PIGTAIL AND BRAIDED COPPER
TROLLEY CONTACT WIRE • RUBBER INSULATED POWER
CABLES • VARNISHED CAMBRIC POWER CABLES • BARE
COPPER STRAND

ROE

ELECTRICAL

# FOR EXTRA TOUGHNESS

## An Example of Roebling Manufacturing Methods

IT TAKES MORE TIME . . . materials . . . man-hours . . . to "lead-cure" rubber* cable jackets. But we know this "extra" pays off for the cable user . . . in greater resiliency, tensile strength, and resistance to tearing, abrasion, impact. And because performance tests prove its advantages, this process is used on all Roebling Rubber Jacketed Power Cables and heavy duty plain flexible cords.

What is "lead-curing"? Roughly, it's what the rubber in a tire goes through when it's subjected to intense heat in a mold *under pressure*. The rubber jacket covering the cable is completely encased in a lead sheath by extrusion through a lead press. This places the rubber sheath under compression during the vulcanization or heat-treating process. When the lead sheath is stripped off, a slick, *tough* rubber coat remains.

This method of heat curing under sustained pressure—besides resulting in a more perfect configuration of cable—assures a denser, more resilient jacket with greater resistance to moisture . . . able to take plenty of abuse . . . tough as a tire itself!

"Lead-curing" is one example of the care which Roebling takes in producing an outstanding line of electrical wires and cables. Let our nearest branch office representative demonstrate the advantages—to *you*—of specifying Roebling.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
*Branches and Warehouses in Principal Cities*

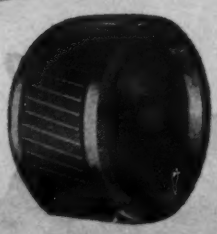
*Selected synthetic rubber compounds, as permitted under WPB regulations, are now used in lieu of rubber in Roebling-insulated wires and cables.

BLING

JR ROEBLING

WIRES AND CABLES

# The Only Motor with a *Copperspun* ROTOR



Only in Fairbanks-Morse Motors will you find rotors centrifugally cast in *one piece*—and of *copper!*

The characteristics of copper make it the ideal rotor material. Copper has high electrical and thermal conductivity (twice as good as aluminum), greater strength, and low thermal expansion.

The indestructible copperspun rotor, with its better electrical characteristics, puts the new Fairbanks-Morse Motor far ahead of the times in stamina, in protection, and in versatility.

See a demonstration of what this motor can do for you. Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

## Every Good Feature You Could Ask!

**Protected Frame**—Excludes dripping liquids and falling particles.

**Cross-flow Ventilation**—Another exclusive feature. Air moves in both directions, providing uniform cooling—no hot spots.

**Ball Bearings**—Sealed in and protected.

**Recessed Conduit Box**—An innovation for neat installations in close quarters. Conventional box also provided.

**Adaptability**—Frame gives protection in any mounting position because the vented bearing brackets can be turned to four positions 90° apart. Reversible frame permits locating conduit box on either side.

**Balanced Characteristics**—A 40°C. motor with high efficiency and power factor, and excellent starting and accelerating torques.

*BUY AND KEEP MORE WAR BONDS*

# Fairbanks-Morse

*A name worth remembering*

**Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps • Scales**
**Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment**

1ST TEST OF A SERIES

# proves that Reliable STRAIGHTLINE SPLICES AND DEAD ENDS

## consistently GRIP and HOLD the full line wire strength

Your assurance of an extra margin of strength and service in Reliable Connectors, Splices and Deadends is the routine, accurate check of the physical properties of both the raw materials used and the finished product produced. Precise quality control insures a gripping surface much harder than the wire. Note the results of a routine Straightline Splice tensile test above.

*Seeing is believing—watch for other test proof*

1. Gripping Test
2. Vibration Test
3. Corrosion Test
4. Conducivity Test

*Above photograph shows laboratory technician testing hardness of gripping jaws of Reliable Straightline Splices*

**RELIABLE ELECTRIC COMPANY**

3145 Carroll Avenue, Chicago 12, Illinois

OVER 35 YEARS SERVICE TO THE UTILITIE

YOU GET ALL THE COMPRESSED AIR YOU NEED WITH

SCHRAMM

AIR COMPRESSORS

For the many compressed air jobs in your steam plants, generating stations, and field work, it will pay you to use Schramm Compressors because you get all the air you need with them.

Schramm Compressors are compact, lightweight, and easy to start, merely by pushing a button.

Schramm features include: completely water cooled to provide ideal service both winter and summer . . . main bearings for every cylinder . . . mechanical intake valve . . . more cylinders and lighter parts . . . and forced feed lubrication.

These features provide many advantages and savings. For full details, and descriptions of the various models, portable and stationary, write today for bulletin AED-44.

SCHRAMM INC.

THE COMPRESSOR PEOPLE

WEST CHESTER

PENNSYLVANIA

CONSTRUCTION
*simplified . . .*

INTERIORS
*modernized . . .*

# *by* MILLER Fluorescent Troffer Lighting Systems

***in factories, stores, offices, schools and public buildings***

**Other Pluses of MILLER Fluorescent Troffer Lighting Systems:**

Supports from structural ceiling reduced 50 to 75%.

•

Conduit and conduit fitting costs reduced up to 80%.

•

Wiring costs reduced up to 50%.

•

Permanent operation and maintenance economies.

Miller Fluorescent Troffer lighting systems are engineered to lick planning and structural problems—as well as lighting problems.

That's why today's trend is to "plan the *building* around the *lighting*." It makes sense that way, for Miller Fluorescent Troffer lighting systems, in geometric patterns and lightstrips "by the mile," suggest new themes for interiors. So do their wide variety of glass and plastic lenses, plates, and metal or plastic grilles—designed to meet specific architectural and lighting requirements.

Behind this beauty, there is engineering versatility and practicability that is mighty refreshing. The Miller patented bracket is an example:

It ends laborious fitting of recessed lighting systems into hung ceilings. Now, these brackets are mounted from the structural ceiling and support both the ceiling and the Troffer lighting system.

All this, plus *lighting* qualities numbered among the outstanding engineering achievements of our time!

Miller distributors and field engineers are conveniently located to serve you.

**THE MILLER COMPANY • MERIDEN, CONNECTICUT**

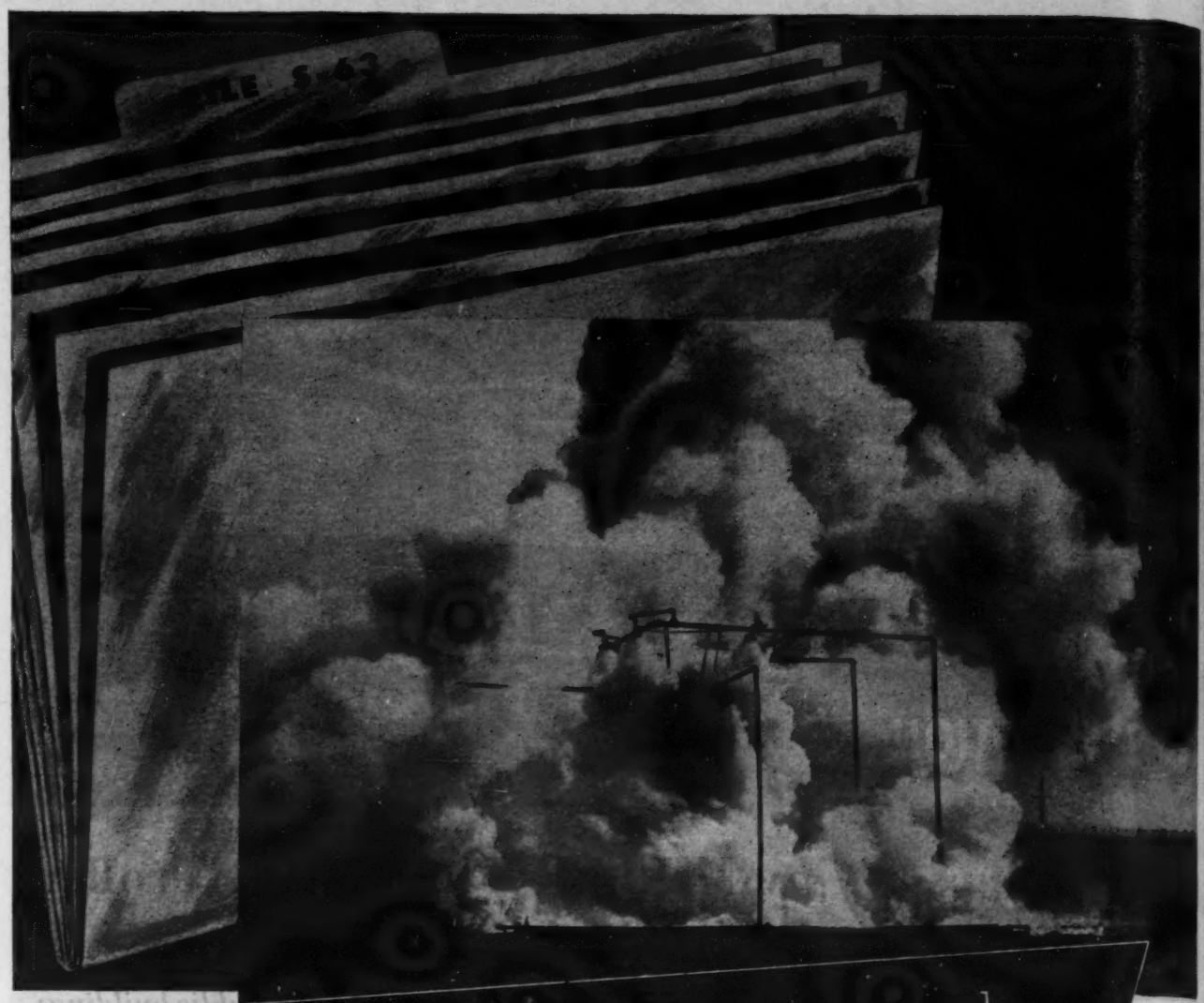
**ILLUMINATING DIVISION**
Fluorescent, Incandescent
Mercury Lighting Equipment

**OIL GOODS DIVISION**
Domestic Oil Burners
and Liquid Fuel Devices

**ROLLING MILL DIVISION**
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

**WAR CONTRACTS DIVISION**
War Materiel

MILLER
SINCE 1844




# from the CARDOX case record . . .

Out of actual on-the-job fire experience comes evidence of the ability of Cardox Fire Extinguishing Systems to stop even *big* fires *fast*. File No. S-63, taken from an investigator's report on Cardox extinguishment of a tough transformer fire is a typical example:

"The fire occurred in the outdoor transformer area. It was caused by a short in the 2500-volt bus section and quickly ignited a protective screen above the busses. This protective screen consisted of burlap, rubber sheeting and plywood.

"The Cardox System was actuated automatically and worked perfectly . . . in less than a quarter of a minute (after mass discharge of Cardox $CO_2$ began) the fire was extinguished. No serious damage was done and operations were resumed after a very small delay. The swift and efficient operation of the Cardox System prevented at least $150,000 damage."

The danger spots in your plant may not be similar to the one described in FILE S-63. But, if for example they involve flammable liquids or electrical equipment of any kind, Cardox offers maximum protection with fast-acting, non-contaminating carbon dioxide . . . in *pounds* for small fires . . . and *tons* for large ones!

For all Cardox Systems have one outstanding characteristic which greatly increases the scope of usefulness and performance value of carbon dioxide in protecting *large* and *small* hazards!

This characteristic is the distinctive Cardox method of control and engineered application of liquid carbon dioxide, stored at 0° F. and 300 p.s.i. in a single storage unit containing from ¼ to 125 tons of fire-destroying Cardox $CO_2$ . . . enough to handle large fires in single or multiple hazards and leave an ample reserve for new emergencies!

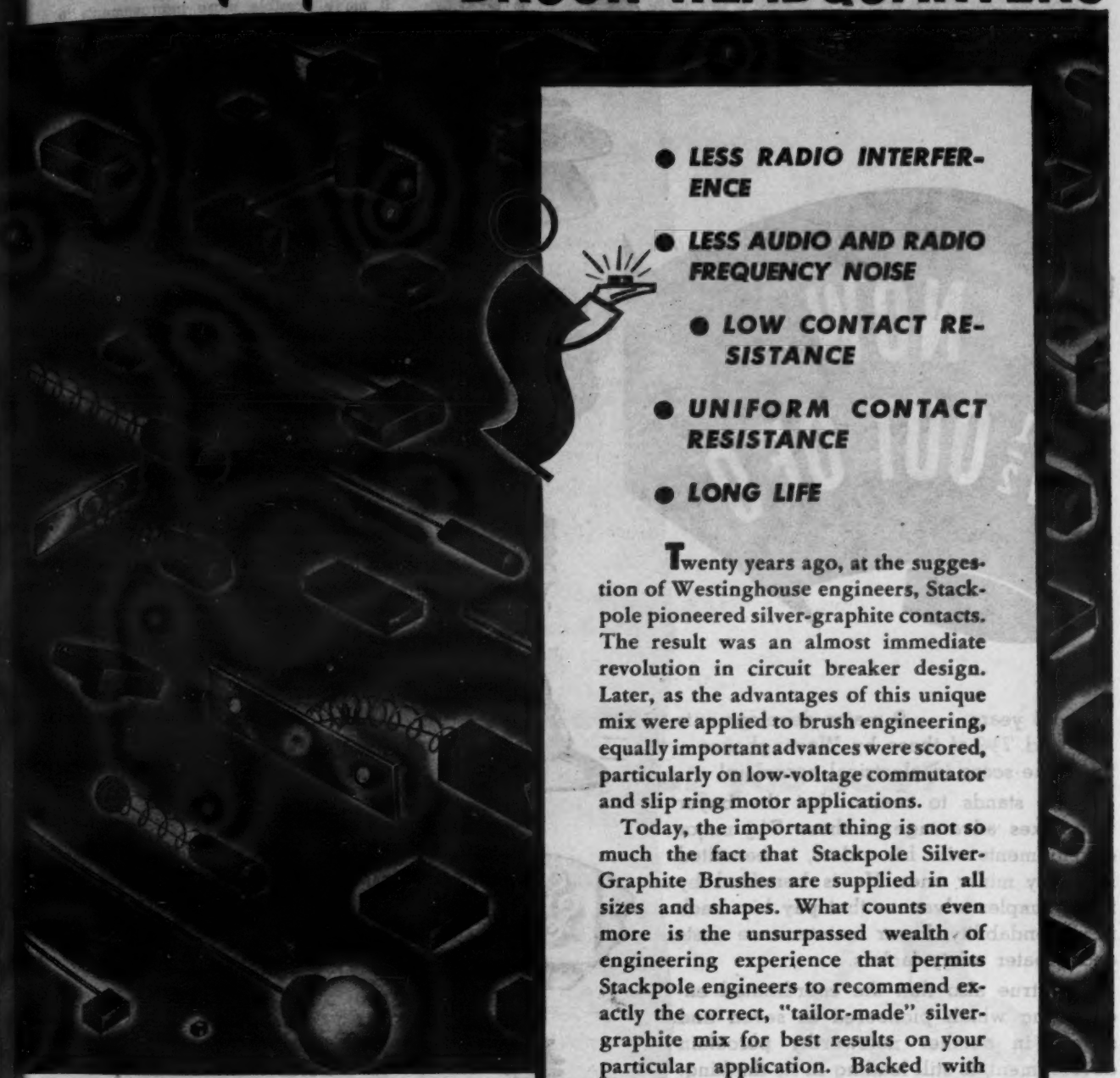
If you have fire problems that are hard to handle, low pressure carbon dioxide can frequently provide the effective answer. A study of your specific fire hazards by Cardox Research Division and Engineering Staff puts you under no obligation. Write for Bulletin 955.

**CARDOX CORPORATION**
BELL BUILDING • CHICAGO 1, ILLINOIS
*District Offices in*
New York, Washington, Detroit, Cleveland, Atlanta, Pittsburgh, San Francisco, Los Angeles, Seattle

**CARDOX**
$CO_2$ FIRE EXTINGUISHING SYSTEMS

Cardox $CO_2$ is supplied instantly in pounds or tons from a single Storage Unit containing 500 pounds to 125 tons at controlled low temperature of 0°F. and 300 p.s.i.

# Silver-Graphite BRUSH HEADQUARTERS



- **LESS RADIO INTERFERENCE**
- **LESS AUDIO AND RADIO FREQUENCY NOISE**
- **LOW CONTACT RESISTANCE**
- **UNIFORM CONTACT RESISTANCE**
- **LONG LIFE**

Twenty years ago, at the suggestion of Westinghouse engineers, Stackpole pioneered silver-graphite contacts. The result was an almost immediate revolution in circuit breaker design. Later, as the advantages of this unique mix were applied to brush engineering, equally important advances were scored, particularly on low-voltage commutator and slip ring motor applications.

Today, the important thing is not so much the fact that Stackpole Silver-Graphite Brushes are supplied in all sizes and shapes. What counts even more is the unsurpassed wealth of engineering experience that permits Stackpole engineers to recommend exactly the correct, "tailor-made" silver-graphite mix for best results on your particular application. Backed with complete details of your equipment, they welcome the opportunity to submit Silver-Graphite Brush (or Contact) samples for test. You be the judge!

**STACKPOLE CARBON COMPANY**
ST. MARYS, PA.

**BRUSHES AND CONTACTS**
(All carbon, graphite, metal, and composition types)
RARE METAL CONTACTS
BEARINGS WELDING CARBONS
PACKING, PISTON AND SEAL RINGS
CONTINUOUSLY ADJUSTABLE CARBON RHEOSTATS
CHEMICAL CARBONS
CARBON PIPE POWER TUBE ANODES
MOLDED SPECIALTIES, etc.

# STACKPOLE

MOLDED METAL POWDER AND CARBON PRODUCTS

# NOW 7½ OUT OF 9

In 25 years . . . 9 major developments . . . and 7½ of these by Westinghouse—that's the score in electrical porcelain!

So it stands to reason that the buyer who takes advantage of these 7½ major developments with his orders, is benefited by many minor ones. He is benefited by many simpler advances that pay him back in dependability, lower maintenance costs and greater safety factors.

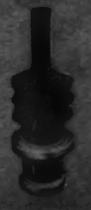
It is true also that the coordinated engineering which pioneered in seven and shared in another noteworthy porcelain development, is still leading in its thinking. Westinghouse Electric Corporation, P.O. Box 368, Pittsburgh 30, Pa.

J-05159

1 **HIGH-STRENGTH SUSPENSION** met the demands of railroad electrification. It increased the load limits of suspension insulators to 25,000 and 36,000 pounds. It made possible more improvements in power transmission.

2 **FARADOID PRINCIPLE** improved the performance of high-voltage transmission lines. Its surfaces were proportioned to conform to the equipotential surfaces of the electrostatic field. It is now an industry-wide standard.

3 **RADIO-INTERFERENCE-PROOF (RIP)**, first introduced in 1930. Helped radio reception by eliminating the usual arcing flow of capacity currents between conductor and insulator surfaces. Now an industry standard.



4 **SOLDER SEALING** opened a new field by making the first hermetic joint between metal and porcelain. It was the only way to give permanent protection to oil or air-insulated equipment, barring moisture and dirt—and has never been surpassed.

5 **BULLETPROOF INSULATORS** had increased section thickness, and surfaces were proportioned to increase proportion of ricochets. Helped solve breakage due to stone throwing and rifle fire.

6 **PRESTITE** revolutionized the use of porcelain because of its dense nonporous structure with high dielectric and mechanical strength. Used for intricate shapes where close tolerances are required.

6½ **LINE AND STATION POST INSULATORS** were a co-development of Westinghouse and other engineers.

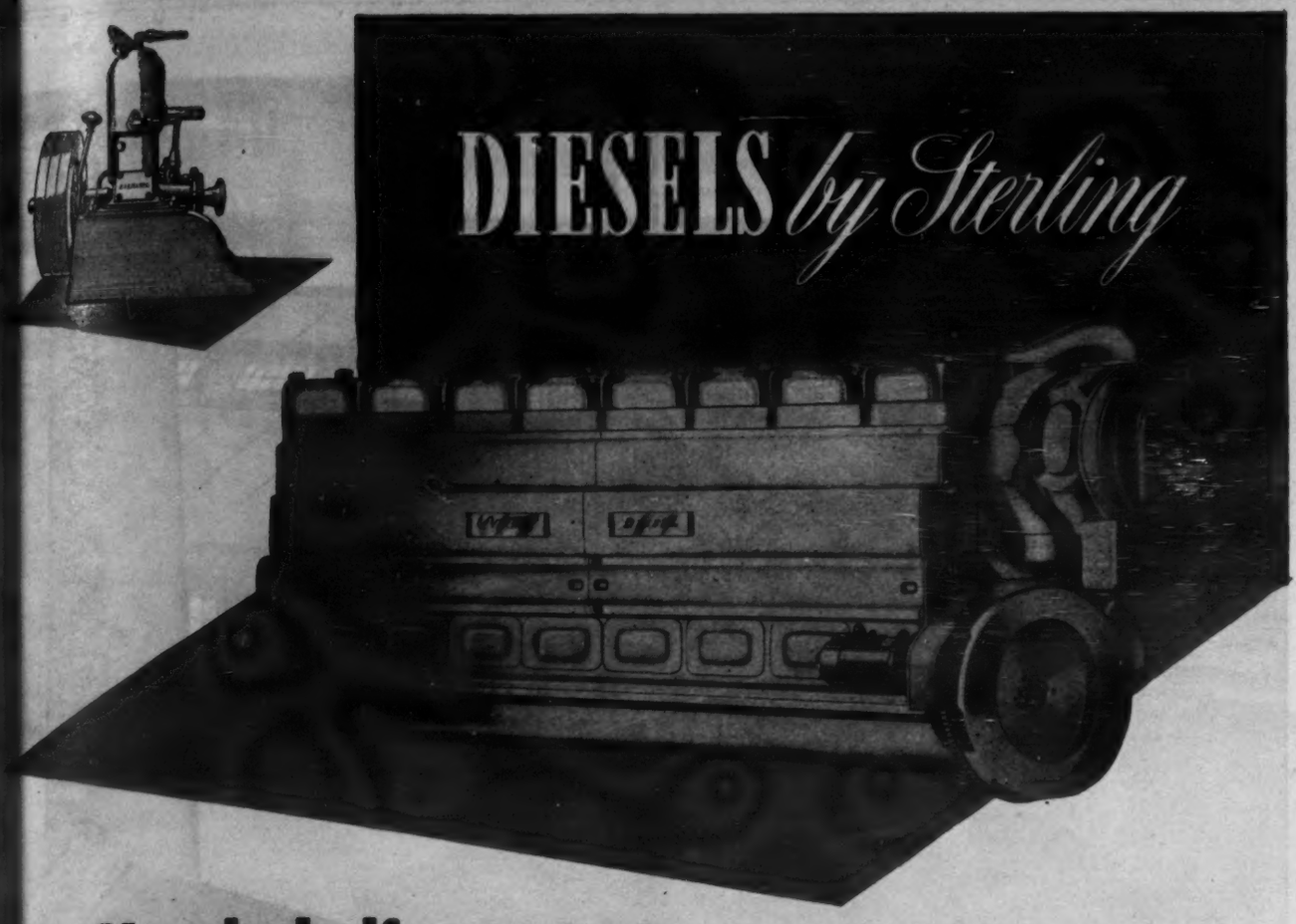
**AND NOW...**

7½ **ZIRCON CERAMICS**, a new high-strength, high thermal shock ceramic is available in certain designs. This development is proving an invaluable tool in the hands of design engineers who are faced with problems demanding tremendous strength, high thermal shock and constant dielectric values at high temperatures.

Westinghouse

PLANTS IN 25 CITIES — OFFICES EVERYWHERE

INSULATORS




## Nearly half a century of engine building experience —ready for you now!

In the new Viking Diesel, Sterling presents the advanced-design engine of tomorrow—a stationary power plant backed by nearly half a century of engineering experience. Covering a wide range of job applications for continuous duty or stand-by service, there are six and eight cylinder models—supercharged and unsupercharged—from 275 to 650 horsepower. Light weight, unusual compactness, operating economy and job adaptability are features fully explained in the illustrated engineering data we would like to send you. Outline your power requirements. Orders accepted now for early delivery.

★ *Other Sterling engines—gasoline, gas, butane and Diesel, from 85 to 1800 horsepower—are also available.*

"KEEP BUYING WAR BONDS"

# VIKING DIESEL

STERLING ENGINE COMPANY, 1292 NIAGARA ST., BUFFALO 13, N. Y. *Offices in New York, Washington and Chicago*

## THERE'S SOMETHING IN THE AIR . . .

THE SHADOWS of slowly descending helicopters will be a frequent sight in the peacetime years to come . . . but only after the war will you learn *all* of the progress in design and the engineering improvements that have *already* taken place. Today's "in the air" performance of several successful helicopter types is known only to the Military Services . . . but in the tomorrows to come it is likely that the ability of helicopters to land and take off vertically . . . to fly rapidly or hover in the air . . . will find many commercial, personal and industrial uses. The patrolling of forest areas and ranches, the inspection of cross-country power and pipe lines, spraying crops; servicing inaccessible places far from airports; are just a few of many useful applications of the helicopter. Kellett's expanding engineering staff looks with anticipation to the future::: when modern helicopters will bring you one of the most progressive developments to come out of this war. Kellett Aircraft Corporation; Upper Darby (Philadelphia), Pa.

# KELLETT

OLDEST ROTARY WING AIRCRAFT MANUFACTURING COMPAN

# NGINEERED HROUGHOUT OR FOUR-WHEEL-DRIVE

Wherever there's a tough job of pole-setting or other construction or maintenance work . . . whenever line-trouble "pops", anywhere, far off the highway over rugged terrain or in muck . . . you can depend on FWDs to get men and equipment through to do the work.

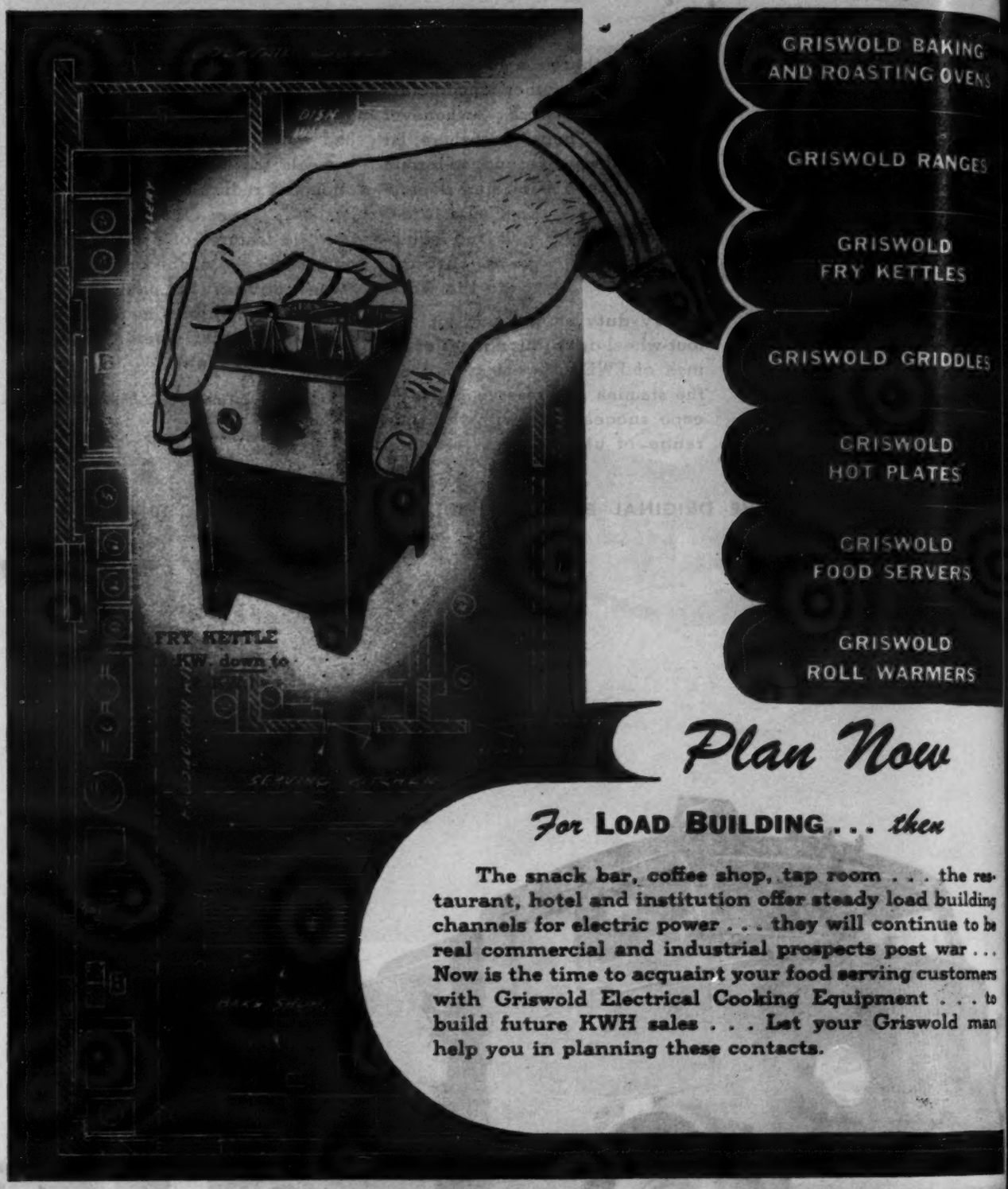
Heavy-duty engineering for true four-wheel-drive throughout every inch of FWDs is what gives them the stamina and reserve power to cope successfully with the wide range of utility requirements.

Maximum power drive, equally distributed to all four wheels through FWD center differential . . . balanced weight distribution on all four wheels that assures positive traction and reduces driving-strain on axles . . . and other performance-proved features of FWD engineering make these, the original four-wheel-drive trucks, first choice of hundreds of utilities, many of whom operate big FWD fleets. Write for the Utility Bulletin.

FWD TRUCKS

**THE FOUR WHEEL DRIVE AUTO CO.**
Clintonville, Wisconsin
*Canadian Factory: Kitchener, Ont.*

**THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS**




# *Plan Now*

## *For* LOAD BUILDING . . . *then*

**The snack bar, coffee shop, tap room . . . the restaurant, hotel and institution offer steady load building channels for electric power . . . they will continue to be real commercial and industrial prospects post war . . . Now is the time to acquaint your food serving customers with Griswold Electrical Cooking Equipment . . . to build future KWH sales . . . Let your Griswold man help you in planning these contacts.**

**THE GRISWOLD MFG. COMPANY ---- ERIE, PA. —** SINCE 1865

1/45
Sample from San Bernardino -
Bishop Line of
California Electric Power Co.
Erected in 1912 - Removed 1-28-44
from Span No. 1008 - 1009

# "Good as New"

## AFTER 30 YEARS' SERVICE

A low flying bomber in California took down a span of A.C.S.R. line, which had been in continuous service for thirty years. Laboratory examination of this thirty-year-old cable resulted in the report "Good as new".

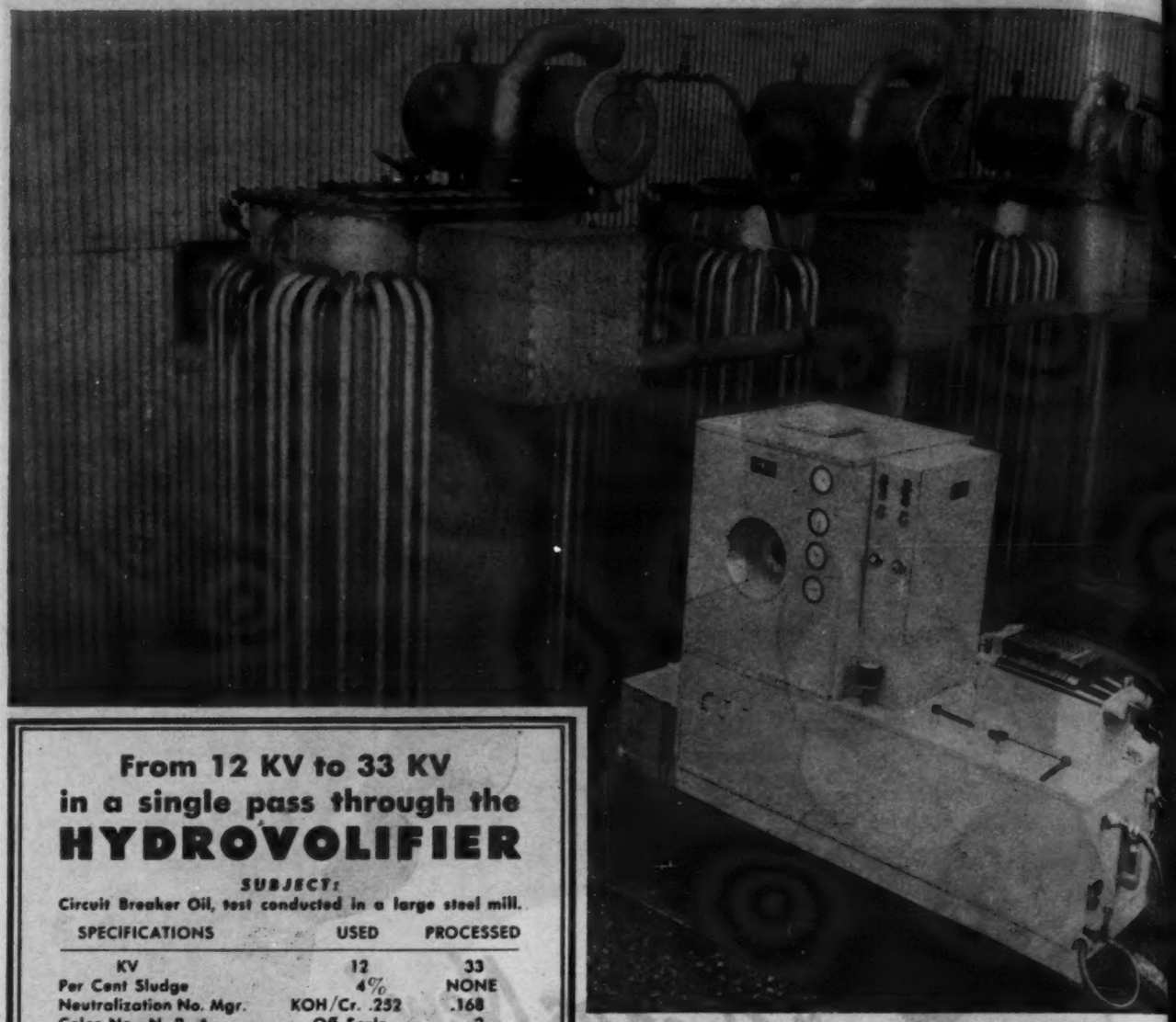
Dependability is an outstanding characteristic of Aluminum Cable Steel Reinforced. More than a million miles sold by Alcoa for rural and hi-lines are evidence of this fact.

Planning to build new lines or extend old ones? Alcoa's engineers will help you select A.C.S.R. having desired characteristics.

ALUMINUM COMPANY OF AMERICA,
2138 Gulf Bldg., Pittsburgh 19, Pa.

# ALCOA A-C-S-R

ALUMINUM CABLE STEEL REINFORCED



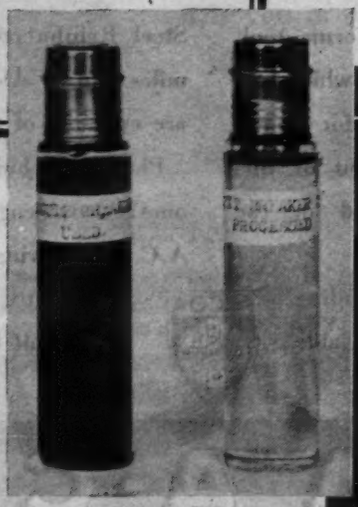
## From 12 KV to 33 KV in a single pass through the HYDROVOLIFIER

*SUBJECT:*
Circuit Breaker Oil, test conducted in a large steel mill.

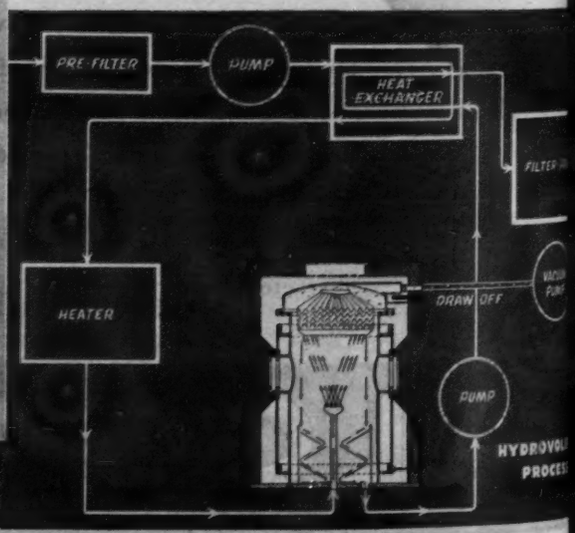
| SPECIFICATIONS | USED | PROCESSED |
|---|---|---|
| KV | 12 | 33 |
| Per Cent Sludge | 4% | NONE |
| Neutralization No. Mgr. | KOH/Cr. .252 | .168 |
| Color No., N. P. A. | Off Scale | 2 |

Circuit breaker oil removed from service at the mill was run through the Hydrovolifier in a single pass. Representative samples of the insulating oil were taken before and after processing. The results of the test show an acid reduction of about 33% and an increase in KV of 275%. Although color reduction is of relatively small importance, it indicates how thoroughly the Hydrovolifier removes colloidal particles.

In the flow chart below—oil passes from pre-filter to pump—to heat exchanger—to heater—to spray chamber—to pump—to heat exchanger—to filter press—back to transformer.



Here are two samples of oil taken during initial test which illustrate the results obtained by a single pass of the circuit breaker oil through Hydrovolifier.



*To get*
*more out of your*
**TRANSFORMERS AND CIRCUIT BREAKERS**
*maintain*
*insulating oil efficiency*
*with the*

# HYDROVOLIFIER

★

• To prevent service failures and to maintain optimum operating efficiency of transformers and circuit breakers, a prominent steel works* processes the insulating oil in these units on a regular schedule with the Hydrovolifier.

One man working on a regular schedule with a portable Hydrovolifier of 100 gal. per hr. capacity handles the 20,000 to 30,000 gallons of oil in the system.

How thoroughly this unit maintains the original high insulating properties of the oil is demonstrated by the test shown on circuit breaker oil.

**Name on request.*

***Available in three standard sizes***

**HV—100 Capacity 100 gallons per hour**
**HV—300 Capacity 300 gallons per hour**
**HV—500 Capacity 500 gallons per hour**

# BUCKEYE
## LABORATORIES CORPORATION

**1965 E. 66th Street • Cleveland 3, Ohio**

*Manufacturers of equipment for maintaining insulating, lubricating, and vacuum oils.*

***For complete details consult a nearby representative***

**BIRMINGHAM**
Shook & Fletcher Supply Co.
(Mr. J. H. Adkins)
P. O. Box No. 2631
Birmingham, Alabama

**BOSTON**
Mr. J. F. Collins
Statler Building
Boston (16) Massachusetts

**BUFFALO**
J. Leo Scanlon Company
(Mr. J. Leo Scanlon)
487 Ellicott Square Building
Buffalo (3) N. Y.

**CHICAGO**
Dutton Machinery & Equipment Company
(Mr. C. B. Dutton)
407 South Dearborn Street
Chicago (5) Illinois

**DALLAS**
R. D. Cope & Company
(Mr. R. D. Cope)
Thomas Building
Dallas (1) Texas

**DETROIT**
L. T. Morrow & Company
(Mr. L. T. Morrow)
810 Fisher Building
Detroit (2) Michigan

**KANSAS CITY**
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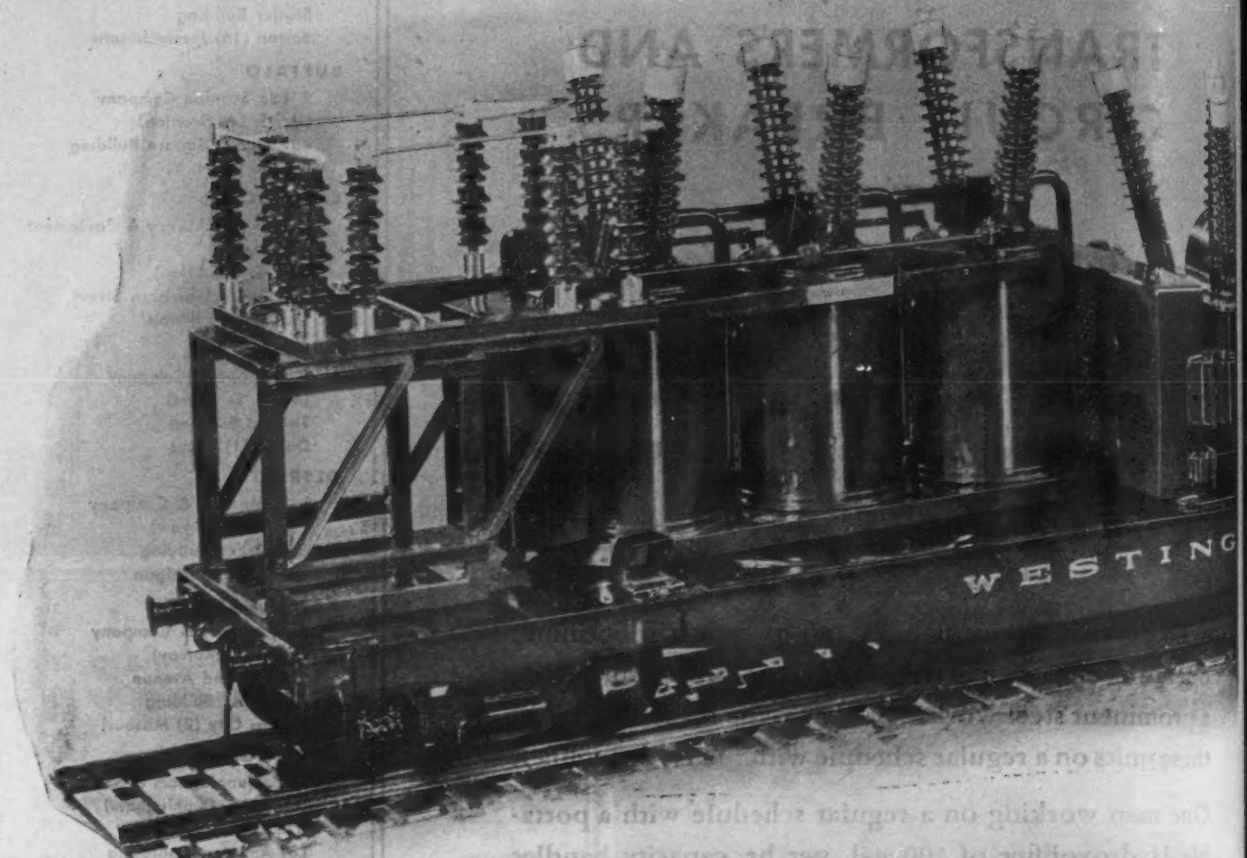
Syracuse (1) New York

**WASHINGTON**
Mr. John J. Herrity
National Press Building
Washington, D. C.

# portable power . . . TO




## ANOTHER WESTINGHOUSE TRANSFORMER ACHIEVEMENT

When the lights go on again in war-torn areas . . . complete, compact high-voltage substations—self-contained within the confines of a standard railway flat-car—will stand ready to move on a moment's notice. They arrive ready to work as quickly as connections can be made.

Flatcar-mounted mobile substations are one of many difficult application problems that Westinghouse has been called on to engineer and produce.

Solving transformer problems like this has given users of standard Westinghouse Transformers many important advantages. Loading-by-copper-temperature is one . . . Hipersil—the weight-reducing, high-permeability steel—is another. The Completely Self-Protected CSP Transformer is a third.

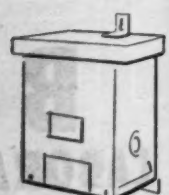
The chances are 100 to 1 that you will find in the complete range of standard Westinghouse types and ratings a readily available answer to your transformer problem. These standardized designs include the best of the features and details that so often have contributed to solving some special transformer application problem. Consult your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-70457

TYPE ASL AIR-COOLED TRANSFORMERS and Power Centers for indoor service

CSP DISTRIBUTION TRANSFORMERS —completely self-protecting

INSTRUMENT TRANSFORMERS —current and potential— indoor and outdoor— all ratings

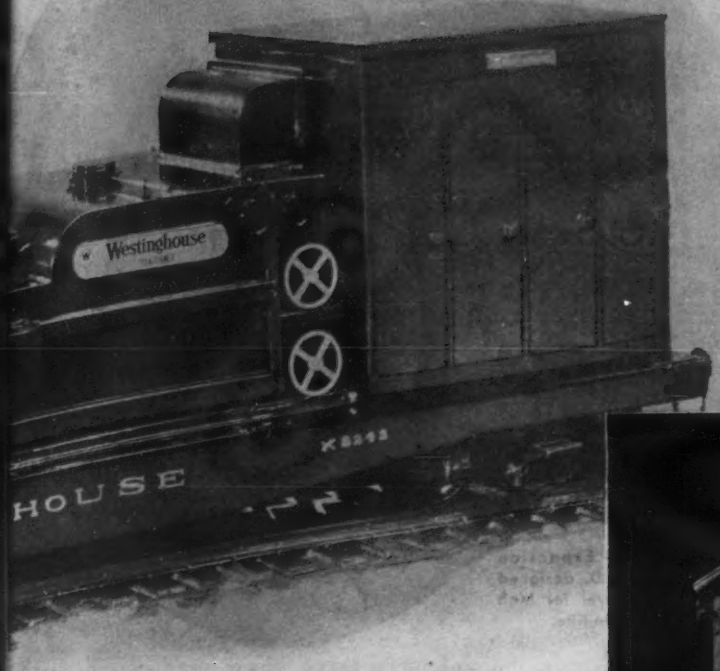


SMALL DRY-TYPE TRANSFORMERS for industrial power needs

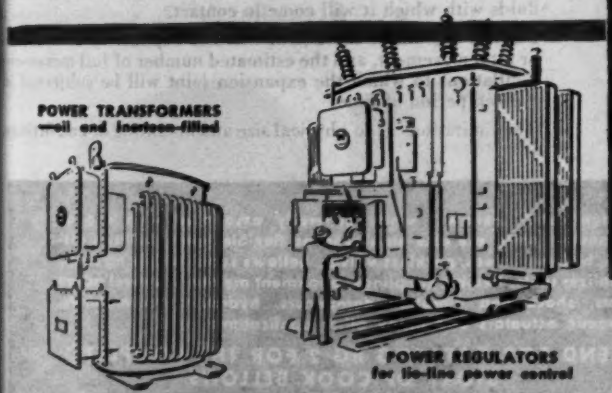
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

# RELIGHT THE LIGHTS OF EUROPE

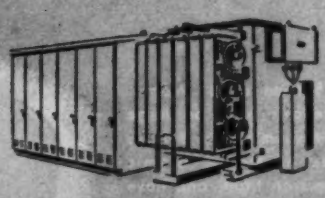



Flatcar substation, similar to model pictured above, has all the switching, transforming, distributing and protective features of a modern conventional transformer substation. It includes a forced oil-cooled, three-phase transformer of shell-form construction . . . best suited to withstand this type of service.



**POWER TRANSFORMERS**
**—oil and Inerteen-filled**

**POWER REGULATORS**
**for lie-line power control**



**UNIT SUBSTATIONS**
**—time and space-saving "Packaged Power" units**

## ONE PACKAGE REPLACES 44 ITEMS

A complete single-feeder substation—in a single compact package! Westinghouse CSP Transformers combine the 44 major components of the conventional substation in one easy-to-order, easy-to-install, easy-to-move unit. They save many valuable man-hours in planning, co-ordinating and construction . . . and they're completely self-protected against lightning, overloads and short circuits.

*first name in* **TRANSFORMER EQUIPMENT**

# "Expansion Joint Problems?"

## ADVANTAGES OF COOK "MAGNILASTIC" EXPANSION JOINTS

While overcoming the ten extraordinary conditions as shown at the right, "MagniLastic" offers additional characteristics which present further engineering advantages as follows:

**Dependability**

Performance of "MagniLastic" expansion joints has proven that with the incorporation of new designing principles and employment of appropriate metals, the expected service life is almost unlimited.

**Predetermined Travel Ratio**

Because of their method of construction, Cook "MagniLastic" bellows can be designed for use at predetermined travel ratios, thus giving an exact amount of travel at any required pressure. This is accomplished by employing the correct metal and through the proper designing of flanges and flange span dimensions and contours.

**Resistance to Corrosion**

Where corrosive factors must be considered, "MagniLastic's" use of all metals and the techniques used in joining these metals can readily overcome such conditions.

**Savings in Maintenance Costs and Time**

In most cases, the installation of a "MagniLastic" expansion joint means the installation of a unit whose life will exceed that of the entire project. Production loss due to replacement and maintenance is therefore, avoided.

**Each Expansion Joint "Custom-Built"**

Cook "MagniLastic" expansion joints are "custom-built" to meet the requirements of each specific application for which they are designed. While many of the sizes and flange types have become standard in a sense that the design itself has found repeated uses, each application is especially engineered to meet the exact requirements of the application. Each application is thoroughly examined and the appropriate metals, flange design and type of metal joining is specified in the design by "MagniLastic" engineers. Thus, each bellows is a "custom-built" job, especially suited to your needs.

**All Sizes—All Shapes—Unlimited Lengths**

"MagniLastic" expansion joints have been designed for service where round, oval and rectangular shapes have been required. They can be designed up to 72" in diameter and, because of their method of assembly, can be produced in unlimited lengths.

ABOVE — Expansion joint, 36" I.D., designed for 6" travel for high temperature line.

We welcome the opportunity in serving your specialized requirements. We are in a position to give you a quick estimate and furnish you assembly drawings, if the following information necessary to design the expansion joint is furnished by you.

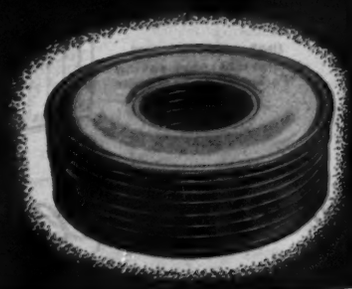
1. Sustained maximum pressure and surges to which the expansion joint will be subjected.
2. Maximum and minimum operating temperatures to which the expansion joint will be exposed.
3. Corrosion factors in terms of the nature and kind of gases or fluids with which it will come in contact.
4. Desired amount of movement whether expansion, contraction or total movement, and the estimated number of full movement oscillations to which the expansion joint will be subjected in a given period of time.
5. The limitations as to physical size and mounting or end fittings.

"MagniLastic" bellows, while generally associated with use as expansion joints, are also employed as flexible joints, bellows pistons, bellows valves, packless valves, bellows seals, revolving seals, equalizer units, flexible couplings, alignment members, swivel action joints, shock and vibration dampeners, hydraulic accumulators, dynamic actuators and many other applications.

SEND FOR CATALOG BG-2 FOR THE COMPLETE STORY OF COOK BELLOWS

*Practice Packless Hydraulics with*

MAGNILASTIC



RIGHT — Section of a MagniLastic bellows used on large packless vacuum valve. Bellows are made of Monel, atomic welded, micron tight, and have a travel range of three times their compressed length. They are used on valves up to 16" inclusive.

# MAGNILASTIC *Can* Solve Them!

## *A bold statement . . . but here are the facts*

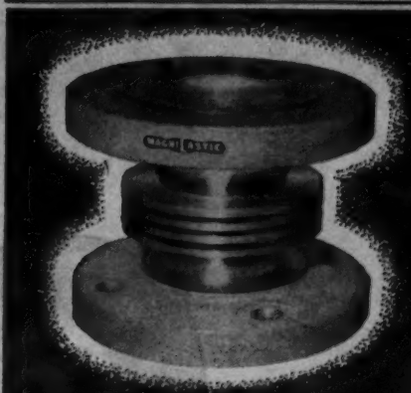
In every case where Cook engineers have had requests for assistance, they have overcome problems of—

1. Extraordinary sizes or capacities
2. Abnormal temperature ranges
3. Tensile strength and creepage of metals
4. Corrosive factors as affecting flange metal or brazing and welding fluxes or materials
5. Excessive pressures
6. Porosities of metal and joints which are specified in fractional microns of vacuum or leak rate
7. Abnormal travel ranges and lateral deflections
8. Heavy duty service as imposed by shock or surges
9. Vibration factors and internal turbulance
10. Unusual limitations in flange span dimensions

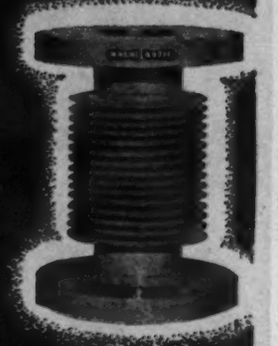
Cook "MagniLastic" expansion joints were originally developed to meet specifications where the ordinary, conventional type of expansion joint just wouldn't do. "MagniLastic" bellows are different in principle, different in design and different in the type of service they will render. These expansion joints are not "crushed" together, they are formed and assembled. The patented design employs new engineering principles of design and fabrication.

The use of all types of metals, such as nickel, Everdur, copper, beryllium copper, high tensile steels, stainless steels, Monel, Inconel, Kovar, Fernico, etc., and the use of all advanced and many secret metal joining processes, enables Cook craftsmen to produce these outstanding units. "MagniLastic" is a great stride forward in keeping pace with all of the unusual requirements necessitated by advanced processes, designs and increased production demands of all industries.

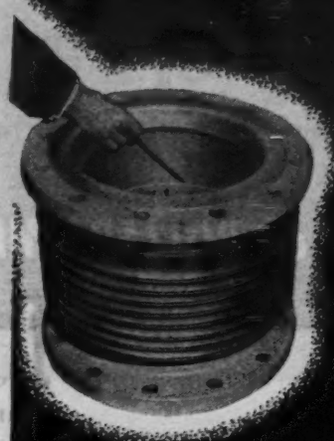
The column at the far left explains the extraordinary advantages of "MagniLastic" design and the illustrations show a few of the hundreds of new, successful developments of "MagniLastic."



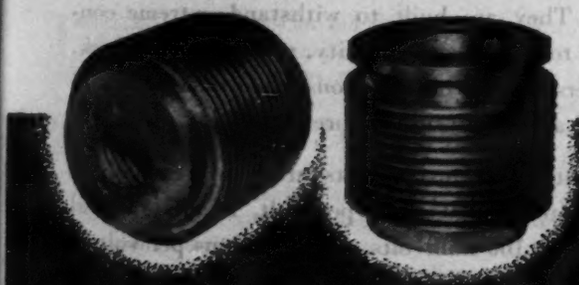
LEFT—A new vacuum and medium pressure expansion joint made of Monel metal, for pressures ranging from 0 to 55 lbs. p.s.i. Total travel is ½" on compression or expansion. Cycleage in average use upwards of 10⁶. Temperature range —300° F. to 900° F. For corrosive gases or liquids.



RIGHT—Special copper brazed steel heat treated bellows for temperatures as high as 500° F. For pressures up to 600 lbs. p.s.i.



LEFT—Special large size expansion joint, Vanstone lap and inner liners made of stainless steel, atomic welded and provided with series 150 end flanges. This expansion joint was designed for use on a 550° F. line, 150 lbs. pressure p.s.i.



ABOVE—Welded Inconel expansion joint with special end fittings. This expansion joint was designed to meet critical corrosive conditions for a special restricted application.

RIGHT—High temperature narrow span exhaust bellows for absorbing the expansion of exhaust piping systems used in Diesel aircraft and similar high temperature lines suitable for temperatures of 1700° F.

**COOK ELECTRIC Company**

SINCE 1897

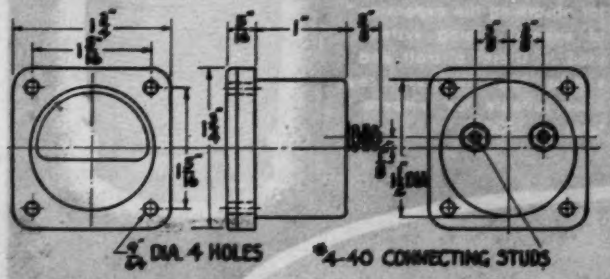
2700 SOUTHPORT AVENUE CHICAGO 14, ILLINOIS

# SMALL BUT STURDY . . .

## The New Line of ROLLER-SMITH 1½" Panel Instruments

*Instrument shown actual size.*

*When desired, solder lugs can be furnished instead of the connecting studs shown.*




Design and development of this line of 1½" instruments were based on rigid U. S. Army Air Force specifications. They are built to withstand extreme conditions of temperature, humidity, vibration and shock, and immersion tests have demonstrated their ability to withstand a hydrostatic pressure of 14.7 psi.

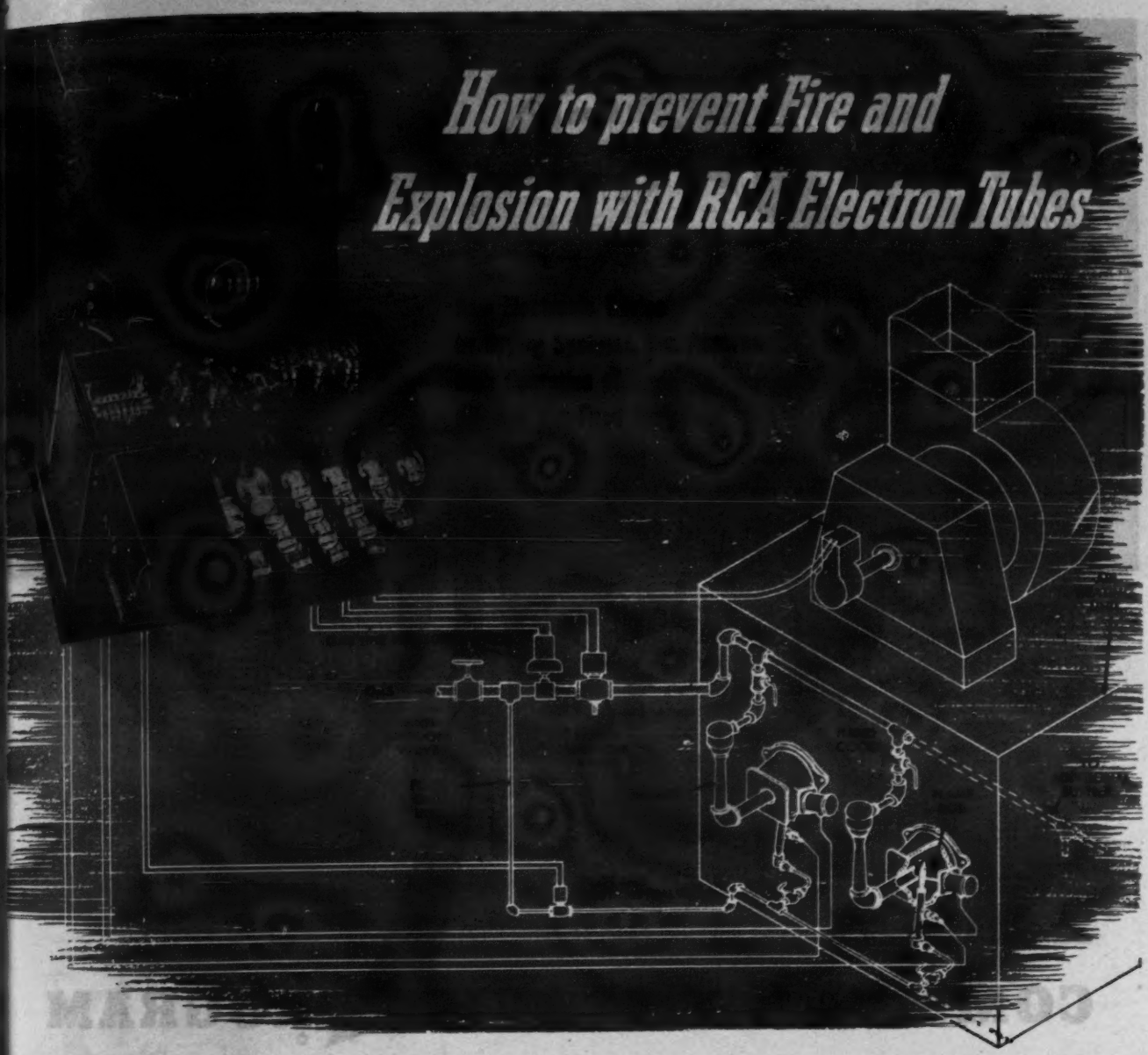
Roller-Smith 1½" instruments are now available in d-c voltmeters, 1000 ohms per volt, in all practical ranges above 100 millivolts, and 100 ohms per volt in ranges from 50 to 100 millivolts; d-c ammeters in all practical ranges above 500 microamperes. For certain applications instruments can be supplied with ranges below those specified. Correspondence is invited.

ROLLER SMITH

*Sales Representatives In all Principal Cities*

STANDARD AND PRECISION ELECTRICAL INSTRUMENTS • AIRCRAFT INSTRUMENTS • SWITCHGEAR • AIR AND OIL CIRCUIT BREAKERS • ROTARY SWITCHES • RELAYS • PRECISION BALANCES

# How to prevent Fire and Explosion with RCA Electron Tubes



INSTALLED in hundreds of industrial plants, electronic safety controls for ovens and other equipment are saving millions of dollars every year by preventing fires and explosions. With electronic control of fuel valves, ignition, blowers, power, and pilot flames, explosive conditions cannot develop.

**How It's Done:** The electronic burner control utilizes the electrical conductivity of the burner flame to complete an electronic circuit. RCA electron tubes amplify this tiny current. Even a momentary absence of flame, due to fuel failure or other causes, breaks the circuit and operates electronic relays to close fuel valves, sound alarms, ventilate the combustion chamber, and perform any required function that will remove hazardous conditions.

### Turn to Electronics for Solution of Your Own Problems

For information on this equipment, write to Drying Systems, Inc., 1800 Foster Avenue, Chicago.

Electron tubes are providing a practical solution to hundreds of diversified manufacturing problems—process control, machine control, heat-treating, plant protection, and a host of others. Consult with RCA application engineers for information or advice on any possible uses of electron tubes in the design of your own equipment. For examples of electronics at work in our own factories, send for the free 32-page booklet, "Electrons In Action At RCA." Write to RCA, Commercial Engineering Section, Dept. 62-55W, Harrison, New Jersey.

***THE FOUNTAIN-HEAD OF MODERN TUBE DEVELOPMENT IS RCA***

Buy war bonds!

RCA

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION · CAMDEN, N. J.

# A RURAL COMMUNITY SERVICE PROGRAM

You are cordially invited to participate in a unique rural-youth educational program designed to stimulate the wider use of electricity on farms.

This activity is based upon the new *4-H Club Better farm-and-home Methods Electric Contest* — which is a logical expansion of the familiar Rural Electrification Contest, sponsored by Westinghouse for the past nine years.

**Objectives of the Better Methods Electric Contest**

To develop among 4-H Club boys and girls a questioning attitude toward methods and equipment used on the farm and to develop practical improvements . . . to teach them how to use electricity more effectively . . . to have them pass this knowledge on to others.

**How these objectives are met**

The new Contest is aggressively promoted . . . through State Club Leaders, County Extension Agents and local 4-H Club Leaders . . . among thousands of energetic 4-H boys and girls.

Better Methods Guide Books, Report Folders, circulars, etc., are currently being distributed widely — to provide the means for 4-H'ers to participate in this Contest.

**A real opportunity for you to build bigger rural loads.**

This program is certain to play an important part in *increasing* your farm load — because it constantly focuses the attention of 4-H boys and girls, and their families, upon the *wider use* of electricity on the farmstead.

As these 4-H youngsters learn by experience that nothing is so *important as* electricity—to the successful operation of a farm as a business — they are bound to exert a strong influence upon their parents for the *complete electrification* of their farms and farm homes!

**You, too, can participate**

The *Better farm-and-home Methods Electric Contest* is a national enterprise which is *right now* in operation in your territory. There is nothing for you to *develop* or *originate* to identify your organization with this program.

The portfolio — *"Here's Help to Increase your Farm Load"* — explains this Contest in detail and outlines steps which your rural representatives and home economists can take in stimulating 4-H participation.

promoting the Better Methods Electric Program

**FREE Contest Promotional Material**

**MEETING GUIDE** — How to organize and conduct 4-H Club meetings. How to set the stage and demonstrate uses of portable motors and other electrical farm equipment.

**POSTERS** — For display in your showroom windows in your farm territory — to stimulate interest in the Contest and announce meetings.

**MAILING CARDS** — Suggestions for mailers — telling 4-H Members about the new Contest — urging them to enter the Contest — inviting them to attend meetings.

**DIRECT MAIL** — Suggested form letter offering your cooperation to County Extension Agents and State Club Leaders.

***In planning 4-H Club activities in your farm territory, be sure to consult your County Extension Agent.***

**HOW TO GET STARTED**—To start the Better Methods Electric Program working for you, send for the new portfolio: "Here's Help to Increase Your Farm Load." In it you will find samples of all of the free material described above, and other helpful information. Contact your nearest Westinghouse Office — or mail coupon, today!

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

**Rural Electrification Section (EW-55)**
**Public Relations Department**
**Westinghouse Electric Corporation**
**Box 1017, Pittsburgh 30, Pennsylvania**

**Please send *free copy* of "Here's Help to Increase your Farm Load."**

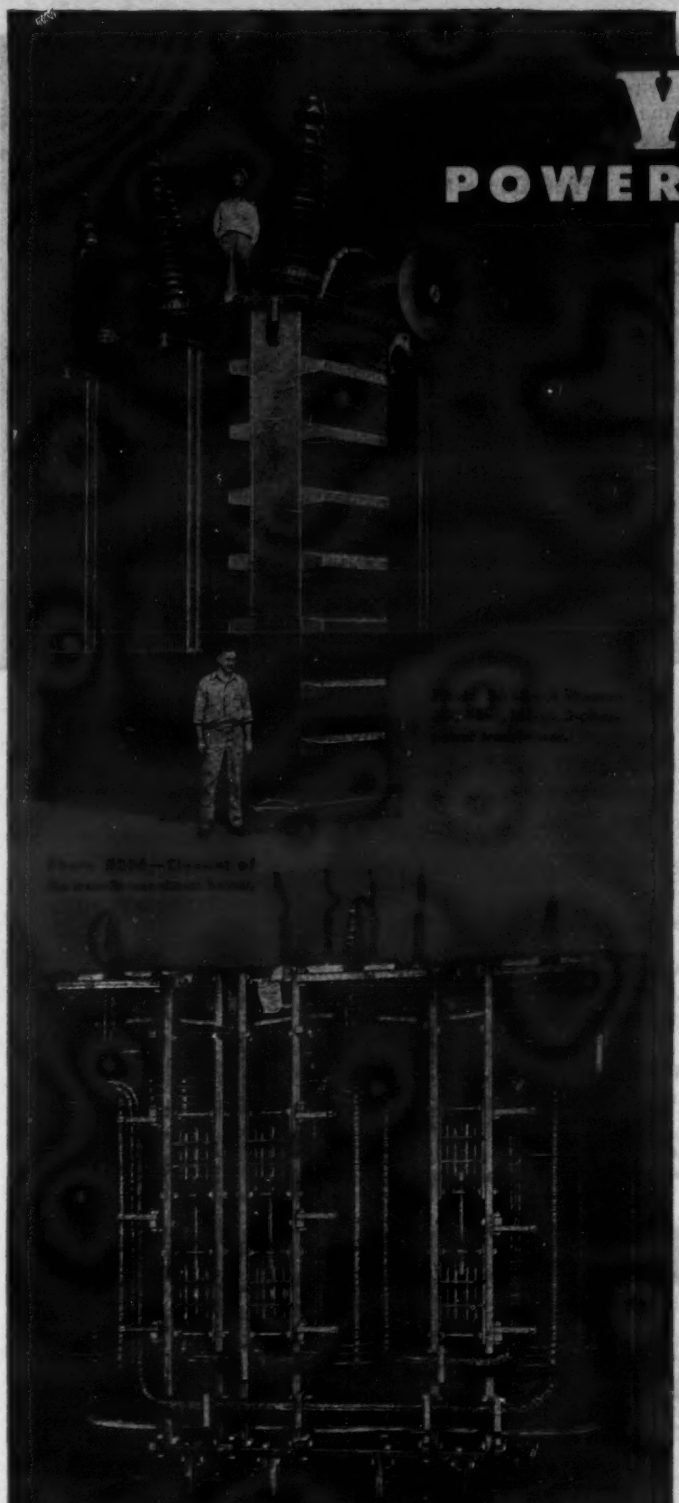
Name..... Position.....

Company.....

Address.....

City..... State.....

# Wagner
## POWER TRANSFORMERS



## *Give Unfailing Service...*

Wagner power transformers are proving their ability to give unfailing service today as they have proved it for the past fifty years. This reliable service has been maintained throughout the years due to Wagner's policy of always utilizing the latest developments in transformer design, materials, and processes of manufacture, executed by skilled workmen (some of whom have been with the company for over forty years).

Every power transformer purchaser, of course, has specific needs which must be met. Therefore, each Wagner power transformer is built to meet these necessary predetermined considerations. Various parts and the methods of fabricating them are standardized, but their final assemblies vary as each individual customer's requirements dictate.

### An *Extra* Margin of Safety to Withstand Electrical and Mechanical Stresses Is Incorporated in Wagner Transformers.

The ten points of construction listed below are but a few of the many details that make Wagner Power Transformers reliable under all operating conditions. There are many others—for the complete story read Bulletin TU-181 on Wagner Power Transformers. A copy will gladly be sent you, without obligations on your part.

**1.** COILS are carefully insulated with cable-paper insulation, the insulation thickness varying with the voltage class of the transformers. The coils adjacent to the line terminals (buffer coils) have much heavier turn insulation than the mail winding and are in addition heavily taped with varnished muslin over the paper insulated conductors. **2.** INSULATION between windings and between windings and core consists of mechanically and electrically strong insulating cylinders. Barriers of pressboard insulation are used between coil stacks on different legs between the coils and the yoke iron, and when necessary between disk coils of the same winding. **3.** LEADS—outgoing and taps—are heavily insulated and rigidly supported. **4.** TAPS are generally brought out in the center of the coil stack. Tap leads may be brought out to a tap changer (as shown) or to a tap terminal board, depending upon specific requirements. Each individual tap is made at the outside cross-over connection between coils. **5.** BOLTED CORE CONSTRUCTION is used in order to clamp the leg laminations together so as to form a rigid structure. It has the added advantage of minimizing noise. **6.** ENDPLATES, of heavy structural steel, are used to clamp the yoke laminations, thus forming a rigid core construction. **7.** COIL CLAMPS, supported by the endplates, are adjustable axially so as to insure positive bracing of the coil stacks against axial motion under short circuit. **8.** CORE SUPPORTS and the extended endplates definitely locate the element in the tank, preventing shifting, and facilitate handling of element when removed from the tank. **9.** TANK is mechanically strong, of heavy copper-bearing sheet-steel, welded into one integral unit. **10.** BUSHINGS are thoroughly modern and designed specifically for transformer use.

**TRANSFORMERS** are but one of several **WAGNER PRODUCTS** serving industry.

Other WAGNER PRODUCTS:

AIR BRAKES
•
HYDRAULIC BRAKES
•
BRAKE LINING
•
INDUSTRIAL BRAKES
•
INDUSTRIAL BRAKE CONTROLS
•
NoRoL
•
TACHOGRAPH
•
ELECTRIC MOTORS

ARMY E NAVY

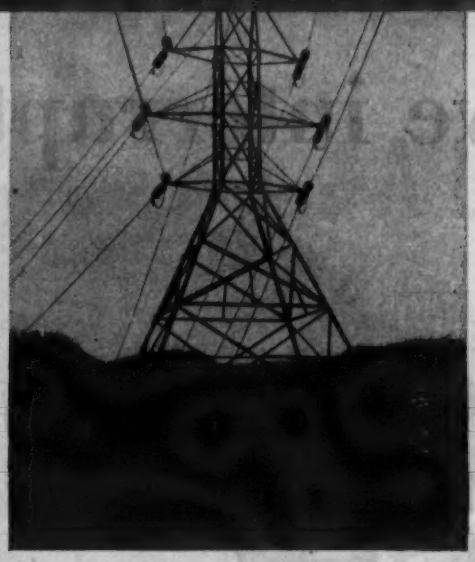
## Wagner Electric Corporation

ESTABLISHED [illegible]

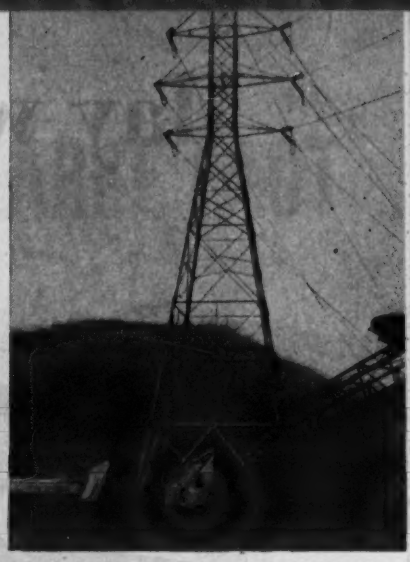
6456 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

**Our 29 Branches are manned by trained field engineers who are ready to help you solve your transformer problems—there is a branch near you.**



Typical double-circuit tower carrying transmission lines over the roof of the power house. The unusual flare at the base provides direct connection and anchorage to existing roof trusses under the roof covering.



Double-circuit strain and angle tower, about 120 feet high, located between two existing substations and to clear storage yard conveyor systems.

ght-spot installation is typified by the new 113-foot angle r at the extreme right. Anchored to its top are the power o double-circuits which here separate into two single its; one top-level circuit is diverted back of the old r crossing tower to the substation; the other is dropped 30 feet and routed under power lines of the river cross- to the substation. The old river crossing tower and ent substation were also American Bridge projects.

A special type single-circuit, 57-foot, strain tower provides for an acute angular change in the transmission line from the power house to the substation.

# TOWERS...

## individually designed and tailored to the job!

DUE to increasing war loads, a recent expansion to generating capacity of an existing electric plant also involved the installation of additional circuit lines for distributing the new power to existing substations and main transmission lines.

The installation of supporting towers for the new circuits, because of limited ground space and overhead clearances imposed by existing structures and a complicated network of power lines, *and the need for quick action,* posed many unusual and difficult engineering and construction problems. All were satisfactorily solved, and with dispatch, by our tower department's technical staff in collaboration with the power company's engineers.

Because of the zigzagging course of the new circuits—around, over and under existing structures and power lines—each tower and its foundation were individually designed and tailored to prevailing site-conditions and to loadings from horizontal and vertical angular changes in alignment.

Pictured here are four of the many tower types designed and fabricated by American Bridge for this particular project. They are indicative of the accumulated experience and ingenuity of our tower engineers, and the fabricating and galvanizing resources of our tower plant.

In emergencies such as this, and when the time comes for postwar construction, both services are yours to draw upon.


AMERICAN BRIDGE COMPANY

*General Offices:* Frick Building, Pittsburgh, Pa.

*District Offices in:* Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* United States Steel Export Company, New York


UNITED STATES STEEL

# Wagner
## POWER TRANSFORMERS

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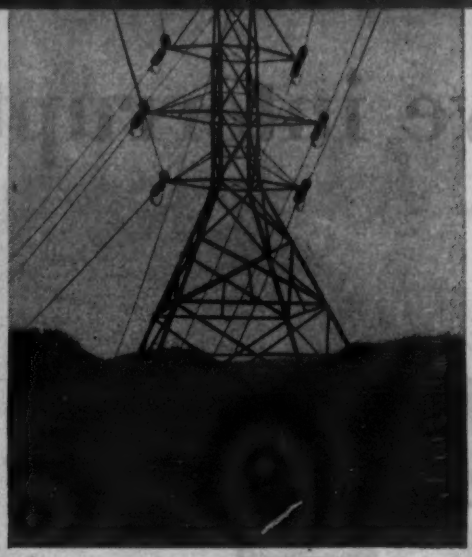

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Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Export Company, New York

UNITED STATES STEEL

# May we interrupt..?

## We can assist you with your post-war plans

IF you are thinking of the multi-story building you will build when the war is over — or

If you are among the thousands of progressive property owners and building managers who are thinking of modernizing their vertical transportation system when labor and materials are available —

We suggest that you get the planning behind you now as we have learned by experience that the preliminary plans for an elevator or escalator installation often take more time than is required for the manufacture and installation.

Your Otis representative is ready now to help you develop your elevator plans... to make preliminary studies and recommendations. Call him today and be assured of the last word in vertical transportation tomorrow.

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

# a little fantasy explains A LARGE FACT

"Maybe it will look right if I stand on my head," said Alice

Alice couldn't seem to understand.

The Mock Turtle sighed deeply, drew one flipper across his eyes, and began again.

"This line is the cost of living going up—and that line is the cost of electricity coming down. Now do you see?"

"No," said Alice, doubtfully, "why don't they go together? One of them must be upside down."

Sobs suddenly choked the Mock Turtle.

Alice was eager to please. "Maybe it will look right," she said, "if I stand on my head!"

☆ ☆ ☆

There is an Alice-in-Wonderland flavor to the simple facts about electricity.

*The average price of household electricity has actually come DOWN since war began!—while the cost of most other things was going UP.*

*There has been no shortage of electricity—the basic raw material of all war production—though most other important war materials have necessarily been scarce or rationed.*

That record is the result of careful planning and hard work by America's business-managed electric companies. And it is your assurance of plenty of cheap electricity for peacetime job production—and for all the new electric conveniences you'll enjoy after the war.

Hear NELSON EDDY in "THE ELECTRIC HOUR," with Rudolf Friml's Orchestra, Tuesday afternoons, 4:30, EWT, CBS Network.

**167 ELECTRIC LIGHT AND POWER COMPANIES**

SELF-SUPPORTING, TAX-PAYING BUSINESSES

DON'T WASTE ELECTRICITY JUST BECAUSE IT'S CHEAP

*Names on request from this magazine

SIDE-DOWN Alice, in the advertisement shown here, illustrates one the most startling facts in today's time living — that —

*While the cost of most other ngs has gone UP, the average ce of household electricity actuy has come DOWN.*

This advertisement appears in ional magazines during May. It is another in the co-operative series reporting the record — past and present — of America's *business*-managed electric companies.

Similar advertising in magazines, farm publications and newspapers is backed by an entertaining and popular radio program — "The Electric Hour," featuring Nelson Eddy — every Sunday afternoon (4:30, EWT) over CBS.

Listen to "The Electric Hour" regularly, watch for the advertisements as they appear, and tell your friends about them. The whole program is doing a job for *your industry—your company—and YOU.*

**167 ELECTRIC LIGHT AND POWER COMPANIES***

SELF-SUPPORTING, TAX-PAYING BUSINESSES

**Names on request from this magazine.*

# *There is no corner grocery store on a Landing Craft*

THERE'S no fruit stand on the bow, no butcher shop on the stern. In this man's war our fighting craft are often weeks and even months away from shore. The food on board must be kept without spoiling for long periods. That means perfect installation of refrigeration.

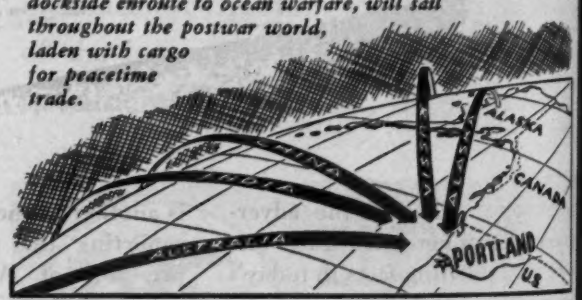
Commercial Iron Works has installed refrigeration units on over 176 vessels from compact PC vessels to giant aircraft carriers. They are built to withstand the test of time and wear and war! Just one more concrete example of the engineering and construction "know-how" that has brought Commercial Iron Works its richly deserved reputation for delivering the goods.

Other CIW achievements include the design and manufacture of gate machinery for ship locks at Bonneville and other Pacific Coast dams; tugs, river boats, dredges; heavy bridge operating machinery, and many types of heavy handling equipment, logging and mill machinery.

CIW's "know-how" has played an important part in this war . . . not only in building ships for the navy . . . but in installing refrigeration equipment, air-conditioning units, pumps, diesel engines, radar and radio on all types of fighting craft . . . this same "know-how", famed before the war, will gain still greater acclaim in the postwar days of industrial development to come.

## PREPARED FOR GLOBAL WAR... AND GLOBAL PEACE!

*Commercial Iron Works is strategically located to serve by rail, truck and water the Pacific Northwest's vast inland empire, as well as the incalculable postwar markets of South America, Alaska and the Far East. Ships now leaving CIW dockside enroute to ocean warfare, will sail throughout the postwar world, laden with cargo for peacetime trade.*




# COMMERCIAL IRON WORKS
## PORTLAND, OREGON

CONTRACTORS • ENGINEERS • MACHINISTS • FOUNDERS • SHIPBUILDING • MARINE REPAIRS • DRYDOCKING

*Streamline Your Plant for Competitive Production*

# LOWER YOUR PRODUCTION COSTS with a Thermix INTEGRAL Fan Stack

Do you face the problem of a highly competitive, post-war market? Will you be looking for ways and means to cut costs? Of course! and that's where a Thermix Integral Fan Stack will pay big dividends as it is engineered from start to finish for money-saving efficiency.

The Thermix Stack is far more efficient than conventional cylindrical stacks and induced draft fans because of its divergent design which converts velocity pressure into static pressure. Because of its size, you save initial cost, building cost and operation . . . yet a complete induced draft unit is obtained. Yes, the Thermix Fan Stack is an induced draft fan, breeching and stack, all in one integral unit. It is designed for highest draft efficiency and puts new life throughout your entire power plant.

Write for Bulletin No. 110 today.

•

**THERMIX ENGINEERING COMPANY**

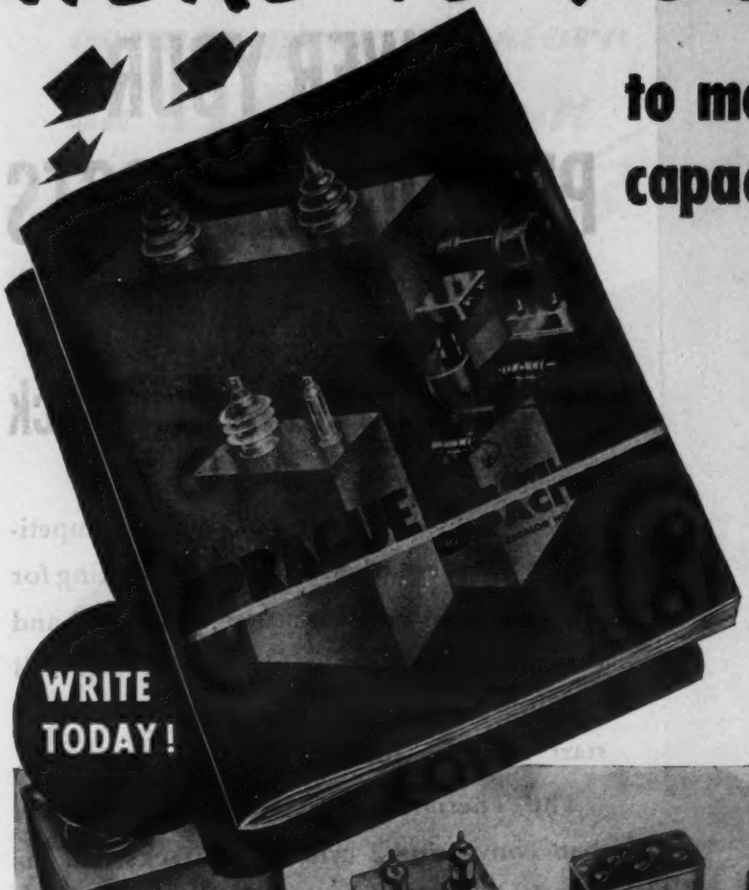
*Project and Sales Engineers*

FIRST NATIONAL BANK BLDG., GREENWICH, CONN.

**PRAT-DANIEL CORPORATION**

**EAST PORT CHESTER, CONN.**

# HERE IS YOUR GUIDE



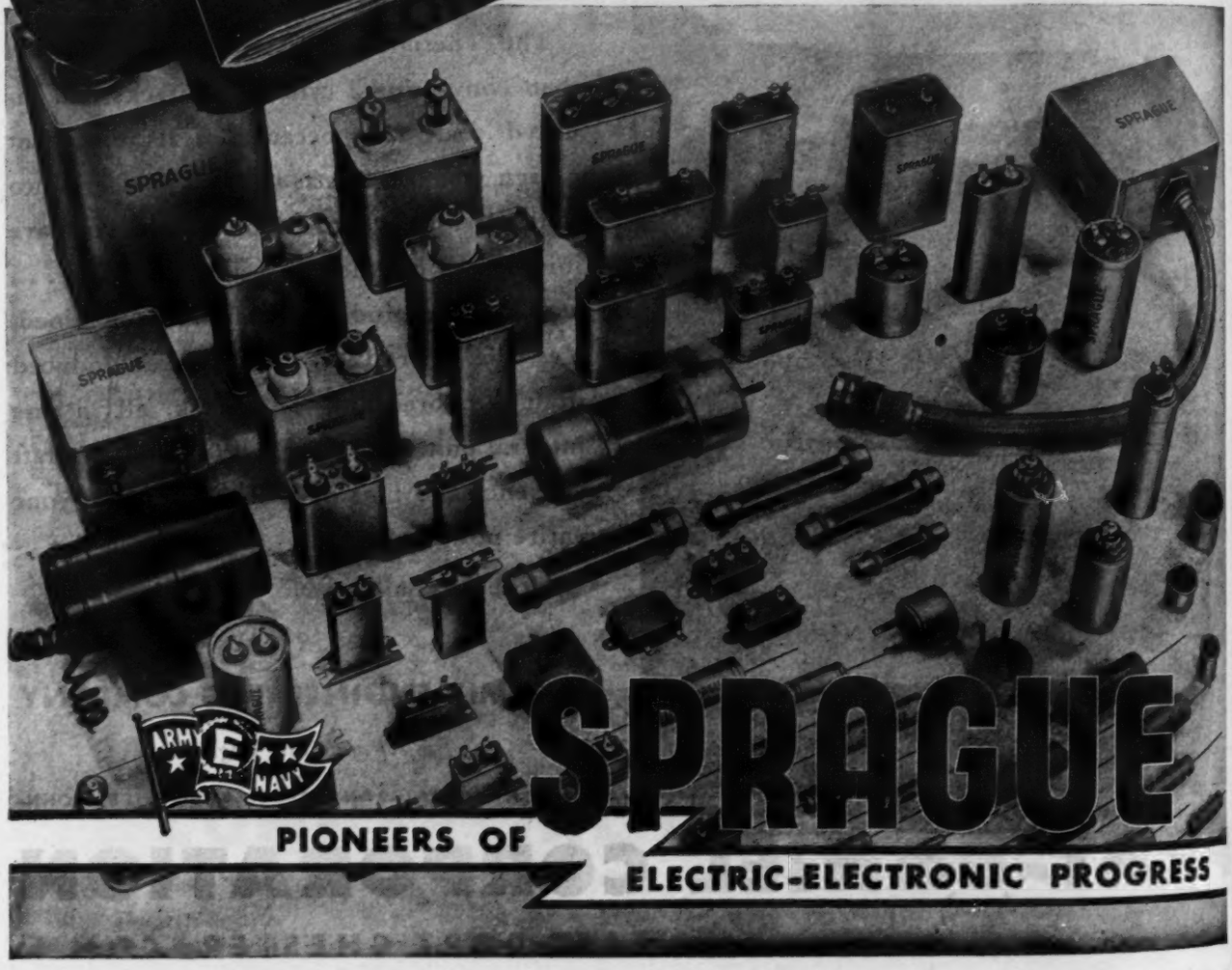
## to modern paper dielectric capacitor selection and use

Months of painstaking work have gone into making this 56-page Sprague Catalog a complete guide to the design and engineering possibilities inherent in today's greatly enlarged line of Sprague Paper Dielectric Capacitors in hundreds of standard and special sizes and types.

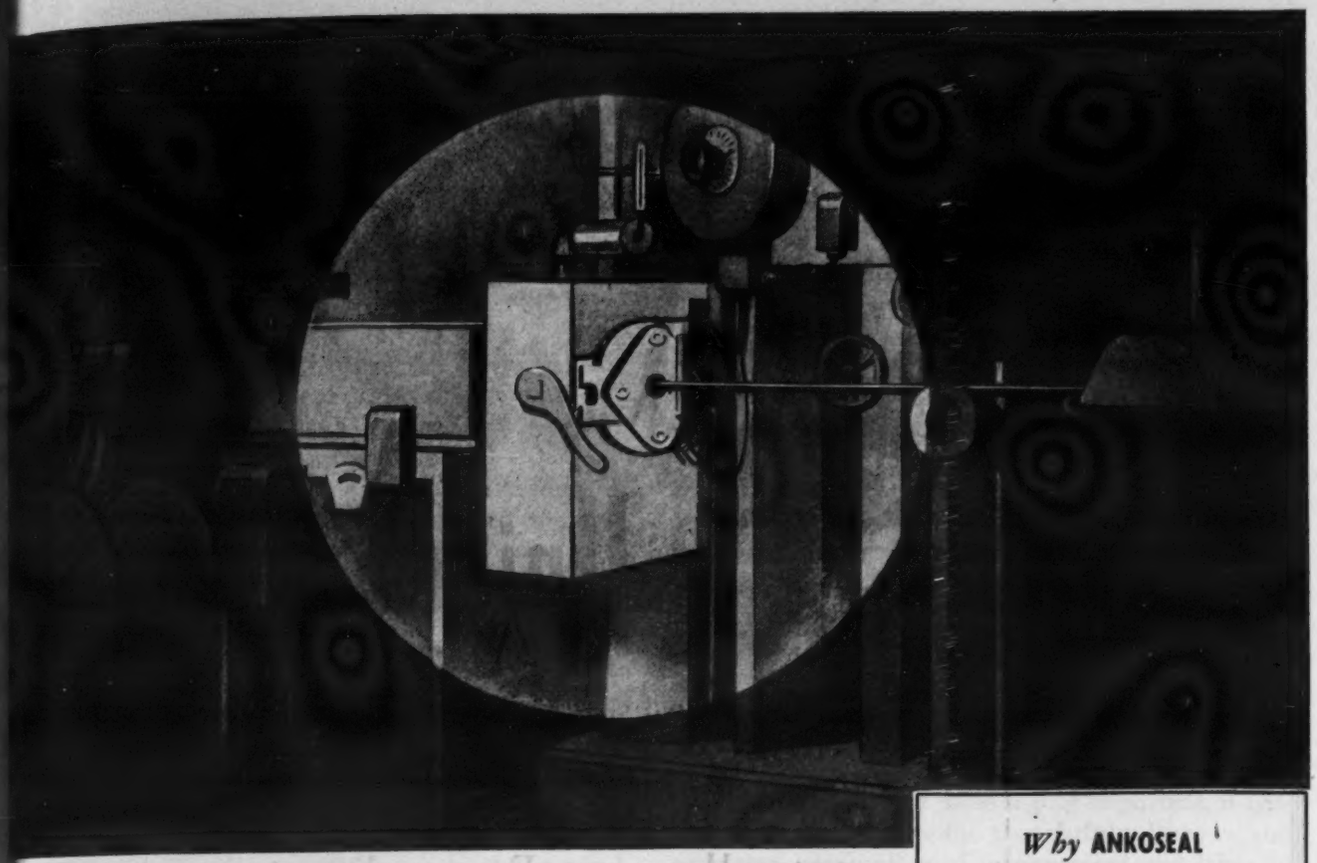
Write for your copy today. You'll find it unsurpassed as a guide to the exact matching of up-to-the-minute Capacitor requirements!

**SPRAGUE ELECTRIC CO.**
**North Adams, Massachusetts**

**WRITE TODAY!**




**PIONEERS OF SPRAGUE ELECTRIC-ELECTRONIC PROGRESS**



# *Where's the Engineer in this picture?*

THE engineer isn't visible in the sketch—but he's there, behind every step in building Ankoseal cable! For, more and more, cables are engineered *and* manufactured to do particular jobs—especially here at The Ansonia Electrical Company!

Because of the many unusual cable demands of the Army and Navy which we have met, we are able to satisfy equally difficult requirements of other government agencies ...or of private concerns engaged in war work. Once we know what the function of the cable is to be, we take over—and from there to the finished product, in engineering and manufacturing, our organization works to deliver the form and type of Ankoseal cable best suited to that job.

That we stand ready to meet such requirements is indicated by our output record...made possible by "Yankee ingenuity" in manufacturing, implemented by emphasis on *continuing* laboratory research. These same facilities, this same ability, are offered to you.

*So*—if you have a cable problem —think of Ankoseal—and The Ansonia Electrical Company. We'll be glad to hear from you!

### *Why* ANKOSEAL *solves cable problems*

Ankoseal, a thermoplastic insulation, can help solve many electrical engineering problems, now and in the future. *Polyvinyl* Ankoseal possesses notable flame-retarding and oil resisting characteristics; is highly resistant to acids, alkalies, sunlight, moisture, and most solvents. Polyethylene Ankoseal is outstanding for its low dielectric loss in high-frequency transmission. Both have many uses, particularly in the radio and audio fields. Ankoseal cables are the result of extensive laboratory research at Ansonia—the same laboratories apply engineering technique in the solution of cable problems of all types.

## THE ANSONIA ELECTRICAL COMPANY

*Specializing in "Ankoseal" a Thermoplastic Insulation*

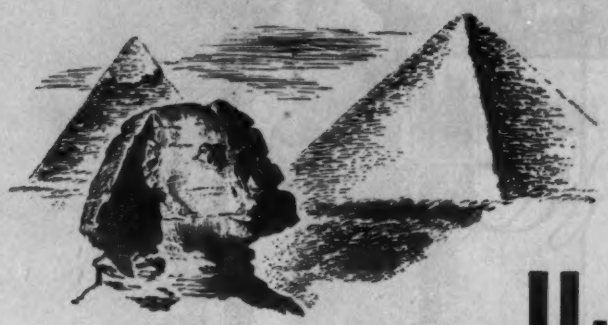
ANSONIA • CONNECTICUT

*A Wholly-Owned Subsidiary of*

## NOMA ELECTRIC CORPORATION

GENERAL OFFICES • NEW YORK, N. Y.

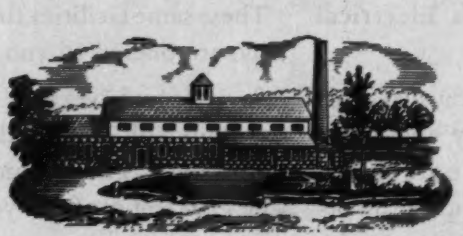
—In peacetime makers of the famous Noma Lights—the greatest name in decorative lighting. Now, manufacturers of fixed mica dielectric capacitors and other radio, radar and electronic equipment.



# Unique

In advertising, many products are described as *unique*—although few actually are. For *unique* means "without a like or equal—unmatched—single in its kind or excellence." In the true sense of the word, *Kerite* is unique—for it has never been duplicated by any other producer.

1854



1864

**The Kerite Insulated Wire & Cable Company, Inc.**

NEW YORK CHICAGO SAN FRANCISCO

*PIONEERS IN CABLE ENGINEERING*

# SUSTAINED CONSTRUCTION ACTIVITY

## *One Step Toward High Level Employment*

IN the 34th editorial of this series, it was pointed out that sustained prosperity, based on high level employment, was a major postwar goal accepted by government, management and labor.

That editorial developed the theme that, if the goal were to be approached without undue sacrifice of our essential liberties, we must forego the search for magic panaceas, and follow the harder but more promising course of analyzing step by step, and industry by industry, the measures that might contribute toward the end sought.

This is the first of a number of editorials following such a particularized approach. It will examine the role of the construction industry in forwarding sustained prosperity.

☆ ☆ ☆

The influence of construction upon the general level of economic activity is important but not decisive. The claim is frequently advanced that major fluctuations of the business cycle might be ironed out by a properly devised and timed public works program; but any examination of the relatively modest contribution of construction activities to total national output will demonstrate its extravagance.

In the twenty years from 1920 through 1939, the value of new construction averaged just over 8½% of the gross national product. If we add repair and maintenance expenditures, the total is increased to a little over 12% of the gross product. But approximately two thirds of the construction of this period was privately initiated, and only one third was represented by government construction, federal, state and local combined. To expect that we can level out the peaks and valleys of our whole economy through manipulating the 4% portion that is represented by government construction is to expect a very small tail to wag a very large dog.

In fact, the record of construction activity in the past has been on the side of disequilibrium rather than stabilization. In boom times construction activity has climbed to relatively higher peaks than those reached by the economy as a whole; in depression periods it has fallen to deeper troughs. Aside from the special work relief program of the depression thirties, the performance of public construction in this respect is little better than that of private. New government construction mounted with the general trend of the boom from 1921 to 1929, thereby adding its weight to the inflationary trend.

Instead, then, of expecting the construction industry to stabilize our whole economy—a task clearly beyond its power—it would seem appropriate to ask that it look to the more attainable goal of leveling out its own violent fluctuations. If this can be done, many of the most vexing problems of the construction field and of its sphere of influence will be mitigated, employment will be regularized in one important segment of industry where the past record has been particularly uneven, and one aggravating contribution to general business instability will be removed.

The achievement of these highly important, if limited, aims will require the thoughtful, vigorous, and concerted cooperation of management and labor in the construction industry, of a variety of governmental agencies, and of those who direct the sources of construction credit. Of the many measures that must be woven into an ordered program, it is practicable here to present only the broad outline of those which seem to offer the greatest potential usefulness.

☆ ☆ ☆

1. Stabilization implies the holding of a balance rather than a freezing at a given level. No rigid formula for a most desirable level of construction activity is possible or desirable. However, it may be accepted as a reasonable initial premise, that we could sustain in the future without major distortion something like the 12% ratio of total construction to gross national product that has been approximated in the past. If it is to serve as an useful reference point, such a generalized premise must be subjected to constant testing both nationally and locally. There must be careful and continuous scrutiny for signs of demand saturation, cost inflation, and labor shortages, all danger signals of far greater reliability than any percentage formula.

The first requisite then is the general availability of information along such lines, far more complete and current than has hitherto been at hand. The second is a general will to hold building activity at a level as high as but not higher than we probably can sustain. Once this principle is accepted, the problem becomes one of marshalling all available instrumentalities to forward it.

2. Public construction, although too small to exert a decisive influence upon economic activity as a whole, can

condition construction trends to a major degree. If, in the decade following the war, government construction approximates its 1920 to 1940 average of one third of all construction, its properly timed impact could do much to level out the construction cycle.

To do this most effectively, public construction should be deferred where and when private building is going forward at a satisfactory pace, and should be started when and where private activity shows undue slack. All government construction does not lend itself to such adjustment. But a large portion of it could be held up for the three to five years which, upon past experience, would provide the necessary leeway to counteract the more violent fluctuations in private building.

Such a program presents numerous difficulties both political and administrative. None should be insurmountable, and the results promise to be of sufficient moment to justify the extraordinary effort that would be required to coordinate federal, state and local government programs. Here is an excellent forum for testing whether or not government economic activity can be made to supplement rather than supplant private effort to serve ends upon which all are agreed.

3. Since private building, postwar as in the past, must supply the preponderant share of construction activity and employment, costs will continue to play a dominant role in determining levels of operation. Wartime restrictions have created formidable backlogs of deferred demand for most types of private, and for many of public, construction. Such demand is so great that it almost certainly will provide the impetus for a postwar building boom of several years duration. There is considerable doubt that in the beginning our building trades, dislocated by war and at low ebb, can organize rapidly enough to carry their share of the anticipated general advance.

However, if former patterns hold, building activity, after a lagging start, will soar, costs will mount, and eventually will saturate effective demand with resultant collapse. That, of course, is precisely the sort of a situation we are seeking to avoid. Crucial to this end is the prevention of rising costs or, better still, the reduction of building costs from present swollen levels.

A recent study by technicians of the War Production Board on the outlook for private housing construction illustrates the point. From 1900 to 1940 the number of housing units built in this country closely matched the statistics of new family formation. The former ran considerably ahead of the latter from 1920 to 1929, and fell behind by the same margin in the following decade.

If the market for new houses were to be similarly limited for the period from 1940 through 1949, the effective demand for new housing during the last five years (1945-1949) is estimated at 3,000,000 units. That is after allowing for houses built from 1940 through 1944, and for vacancies, demolitions, and other factors. If, however, prices could be reduced to 1939 levels, the 3,000,000 unit demand is estimated as increasing to more than 7,000,000 units. Since the latter figure is substantially beyond our production capacity for the period, a backlog would be created that would support an effective sustained demand for the subsequent decade (1950-1959) of 1,000,000 units per year, as against half that amount if rents and sales prices mount with increasing incomes.

The precise accuracy of such an estimate may well be questioned. There can be no question as to the general validity of the point illustrated. The progressive lowering of construction costs will stimulate demand in this field as it has in others. Building management, labor, and their suppliers and customers stand to gain from such a result. Unnecessary restrictions against the adoption of improved technologies and increased productivity should, therefore, be removed, whether imposed by codes of government, regulations of unions, collusion of managements, or inertia of workers. Unless there are compelling social justifications such restrictions must be judged harmful to the whole economy.

4. Numerous other measures could contribute substantially to increased and increasingly stable construction activities. Space remains only to stress the importance of careful consideration for the use of credit facilities as a means of stabilization. In recent years the establishment of the Federal Housing Administration provided a needed stimulus to mortgage lending in the field of housing. The modern pattern of long-term mortgages, providing for regular amortization as well as interest, should be a steadying factor in periods of liquidation. However, there appear to be further possibilities for using credit facilities as a brake when construction activity threatens to climb beyond a level that can be sustained. If public and private lending agencies could devise sound means for raising mortgage rates, increasing down-payment requirements, shortening amortization periods and basing value appraisals upon normal rather than inflated costs, they might exert a healthy influence against the tendency of the construction bubble to inflate until it bursts.

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There is no royal road to sustained high level employment. There is not even a single path to assured construction stability—there are many paths, all strait and narrow and all paved with bruising cobbles. This is true for all other major segments of industry.

It is easier to seize upon a magic formula such as monetary control, or deficit spending, or any one of a score of others, than to undertake an intricate task of piecemeal exploration. But only the latter course will lead to prosperity.

James H. McGraw, Jr.

*President, McGraw-Hill Publishing Co., Inc.*

Electrical World
MAY 26, 1945

# Staffing for Tomorrow

THE ELECTRIC UTILITY INDUSTRY is gradually getting a new set of pilots. While the change has been going on for some time, its tempo appears to have been accelerated since the first of the year. By the end of the war it is probable that systems representing half or more of the privately owned generating capacity will be under the direction of men who have held that top responsibility for less than ten years. This is a healthy condition for the post-war problems are going to put heavy burdens on utility executives, to cope with which young men of stamina and flexibility of mind are needed.

It is not enough, however, just to change pilots. What about the rank and file other than clerical and common labor? What is their average age? Even before the war it was in the forties and by now is probably past fifty. If this is so, or even nearly so, it is too high to supply the liberal and bold kind of thinking that is going to be needed.

Of course, demobilization will return many young men to the business but below them a still younger group is needed in larger numbers than any year since the end of the '20s.

It may have looked like good economy in the depression to cut the number of new recruits down almost to the vanishing point but with the war shortage following it may not have been such a wise move. The gap during which a large amount of young blood wasn't coming into the business has been too long and now the ranks of young men must be filled at the earliest possible moment.

However, it is one thing to have a need and another thing to fill it. For some time at least, all business is probably going to be competing for the young college graduate. Where will he go? It doesn't take much thinking to answer that question. He'll go where there is the greatest opportunity. And that will be particularly true of the fellow who returns from war to finish his schooling. He wants to move and move fast in whatever job he takes when he puts away his school books.

What has the utility industry to offer young men? Will the industry continue to offer security, or will it offer men responsibility on a merit basis? Strong competitive industries are driven by young men who have ambition. This is the big thing that private enterprise holds out for men of initiative.

If the utilities are willing to accept the principles of competition for these men they will find that the same fellows will apply competitive principles to the operation of the business, which will be very beneficial.

Regardless of how the industry may be set up it is going to be more and more in a competitive environment. Our most successful businesses grew big on completion. It supplies the incentive to drive down prices so more can be sold, the incentive to build a better product or to give a better service.

Young men love that kind of battle. If they are to be attracted to a business—that is, the right fellows—they must be shown a future filled with incentives. And now that the industry is well along its program of rebuilding at the top, perhaps it will give some serious attention to rebuilding at the bottom with young men looking for such a future.

# Flood Control Requires Valleys Nature Provides

***No river has had its greatest flood—Water retentive measures, including preservation and extension of natural-channel storage capacity of the basin needed to offset ever-growing factors conducive to floods***

*C. N. PHILLIPS*, Ebasco Services, Inc., New York*

FLOODS are natural phenomena which cannot be prevented. They are relatively frequent in occurence, and at times they are destructive because man—

1. Insists on living and working within the well-marked natural flood plains of rivers;

2. Obstructs the river channels and flood plains with his works;

3. Has by his works impaired the water retentive qualities of the areas on which the storms fall.

In some instances the occupancy of dangerous flood plains is the result of shortsightedness and carelessness. But in most cases the bottom lands along the river are the most productive for agriculture. The original location of many cities was dictated by the existence of a waterway, which at the time was the only available cheap transportation for goods and produce. Regardless of the cause, many areas are vulnerable to damage by floods. It is significant of the times that these localities now are calling on the federal government for protection, rather than meeting the problem by themselves.

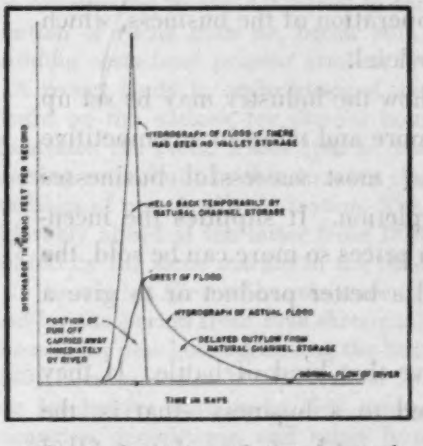

HYDROGRAPH OF FLOOD IF THERE HAD BEEN NO VALLEY STORAGE
HELD BACK TEMPORARILY BY NATURAL CHANNEL STORAGE
CREST OF FLOOD
HYDROGRAPH OF ACTUAL FLOOD
PORTION OF RUN-OFF CARRIED AWAY IMMEDIATELY BY RIVER
DELAYED OUTFLOW FROM NATURAL CHANNEL STORAGE
NORMAL FLOW OF RIVER
TIME IN DAYS

**FIG. 1—Comparison between actual flood and what the same flood would have been without channel storage. Drainage area, 60,000 square miles. Acre-feet involved, 9,000,000**

* Adapted from paper recently presented at Atlanta meeting of Engineering and Operation Section of Southeastern Electric Exchange.

Each successive flood in a given drainage area is different. This is due to variations in the intensity of rainfall, its distribution over the watershed, the direction and type of the storm, and the condition of the soil. Such factors as size, shape, elevation, topography, geology and location of the watershed cause variations in flood effects as between watersheds.

In general, the height of the flood, rather than its duration, causes the greatest loss of life and the major part of the destruction of property. A long-continued high water may, however, be costly because of the length of the disruption of communications and other essential services, and the suspension of industrial and farm production.

It is possible, through knowledge of conditions in a watershed, to recognize that the stage is set for a flood. But it is impossible to forecast when the right combination of setting and storm will take place to produce a destructive flood. Once the critical storm has hit and its intensity is known, some advance notice, ranging from a few hours on a small watershed to a considerably longer period of time on streams like the Mississippi, can be given as to the time and approximate height of the crest.

Past floods are not reliable guides to the height of future floods. Water records in this country cover only a short span of years.

Deforestation, farming methods, draining of swamps, channel constriction and the building of dams all tend to speed up and increase the heights of flood crests, as well as to enlarge the volume of the water to be handled.

For these reasons, it is probable that the maximum flood has not yet been recorded, but it is obvious that it will certainly happen, perhaps tomorrow, or perhaps at some more distant date. Of course it is necessary to design flood control works to meet such a catastrophe. By the study of storm and drainage area characteristics, it is possible to approximate what this maximum flood may be. The Army Engineers call such a maximum super flood a 500-year flood and design their structures physically to be safe against it.

### *Flood Discharge*

Few persons realize the great volume of water which comes down a big river during a large flood. For example, the Ohio River during the 1937 flood discharged a total of over 135,000,000 acre-ft. of water at Cairo, although but 153,000 acre-ft. of water passed that point during the hour when the flood was at its crest. For those readers who do not know what an acre-foot of water is, it is 43,560 cu. ft., which is the volume of water that will cover one acre of land, one foot in depth. During the same flood, 240,000,000 acre-ft. of water passed Arkansas City, Arkansas, on the Mississippi, only 180,000 acre-ft. of which went by during the hour in which the river was at its

maximum crest. The very size of these figures epitomizes the scope and magnitude of the problem which confronts the engineer when an attempt is made to control floods from large drainage areas by means of reservoirs.

Difference between the total volume of water coming down a river during a flood and the relatively small amount of this water which arrives at a given point at any one time is also very striking. The chief reason for the difference is the existence of natural storage in the river channels and flood plains both on the main stream and on the tributaries. Another term often used by engineers for this factor is valley storage. All or the greater part of the great "slug" of water that constitutes a flood, at any one time while it is in progress, must be contained in the valley; there is no other place for it to be.

### *Channel Storage*

Extent of channel storage in specific sections of rivers is very great indeed. The Army Engineers estimated that before the TVA dams were built,

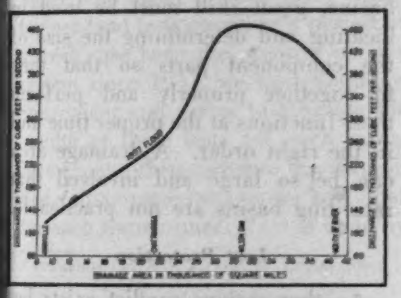


FIG. 2—Effect of natural channel storage on 1897 flood on Tennessee River

the channel storage in the main stem of the river from Knoxville to Aurora Landing, 42 miles above its mouth, was over 14,000,000 acre-ft. during a maximum flood.

Effect of channel storage on flood crests (Fig. 1) shows the contrast between the actual flood at the particular point and what the same flood would have been if no natural channel storage had existed. For larger drainage areas, or for a larger flood on the same drainage area, the difference between the two would be much greater.

It follows, therefore, that in many river basins the peak discharges of many floods actually decrease after a certain point on the river is passed, although the total tributary drainage area continues to increase (Fig. 2). The reason for the great reduction shown was the large amount of natural channel storage in the lower 250 miles of the Tennessee River. This stretch of the river is now occupied by the Pickwick and Kentucky reservoirs, and the natural storage that so effectively cut down the crest of this flood, is now deep under permanent lakes, and thus has been obliterated forever.

### *Two Basic Controls*

It is obvious that there are two basic factors of great importance in controlling floods:

1. The water retentive qualities of the drainage area should be preserved. Practically everything done by man, such as the drainage of swamps, deforestation, and destructive farming methods, has been the opposite effect.

2. Nothing should be done to reduce the natural channel storage capacity of a river basin. Again, the works of man, such as the building of levees without proper planning, encroachments in the river channels and flood plains, canalization, and the building of dams, all tend to lessen this essential storage capacity, or to modify it with adverse results.

Objective of flood control is to protect the lives, property and businesses of the people living within the flood plains of rivers and streams. Small erosion dams, reforestation, contour plowing, cover crops—all the many devices of the soil conservationist, most effectively reduce the volume and height of floods. Adequate river channels and levees, where properly applied, are a simple and direct protection against floods and constitute a device which has been widely and successfully used. The Mississippi is controlled entirely by levee and channel improvements.

Another practical way to reduce flood peaks is to increase the amount of channel storage by the construction of retarding basins at suitable locations upstream from the area to be protected. These dams, like the natural channel storage, hold back a portion of the water temporarily. This method has been used with great success on drainage areas of relatively limited extent.

True retarding basins are formed by simple dams or barriers at suitable sites. Each dam is equipped with an outlet or slot, without gates or any other artificial means of controlling the flow. The outlet of the retarding basin is of such size that no more water can pass than the river channel below can carry. The basin acts just like a bath tub without the plug. Water will flow out of the tub or basin as fast as it comes in up to the capacity of the outlet. But if water enters at a faster rate, the drain will not carry all of it off, and the remainder backs up in the tub or reservoir, to be carried off gradually as the inflow is reduced or cut off.

FIG. 3—Five retarding basins of Miami Conservancy District make Dayton "safest city in the world"

Except during the few days when water is backed up behind the dams, the basins are dry and their rich lands are farmed. Most floods occur before the growing season; there is no scour or erosion and the lands are, in fact, often enriched by the deposit of silt. Farm buildings are located above the flood line, so that there is no damage to houses, barns or livestock.

Where the physical situation permits, and the drainage area is not too large, generally a practical and economic plan for flood control might consist of an improved river channel of uniform carrying capacity plus enough added flood storage capacity so located and designed that no more water reaches the improved river channel at any time than can be handled by it without overflowing. It is evident that to accomplish such

a result in the most economic manner, a comprehensive plan for each area to be protected is necessary in which structures are so designed and balanced as to give complete protection for the lowest possible cost. It also is evident that if such a plan is put through, the improved river channel must be kept under strict control to prevent future constrictions and encroachments.

### *Flood Control Program*

A comprehensive flood control plan should afford full protection against the worst flood that can be expected. Partial protection is a poor substitute for complete safety. While half-way measures may be reasonably effective against minor floods, they may be entirely useless when a great flood happens along. In addition, they may engender a false sense of security among the shortsighted, with a consequent loss of life and heavy property damage when the day of reckoning comes.

These principles have been successfully applied in the five dry retarding basins of the Miami Conservancy District (Fig. 3), which pioneered this type of flood protection in this country. The flood control reservoirs are located on the tributaries and upper part of the Big Miami River, in southwestern Ohio. They are all situated above the principal areas to be protected. The drainage area is over 3,672 sq. mi. above Hamilton, and 2,600 sq. mi. above Dayton. The flood control project is a combination improved river channel and dry retarding basin system. Complete protection is given to the cities and industrial areas, and practically complete protection to agricultural lands below the dams. The works were paid for entirely by the citizens of the Miami Valley. Combined gross storage capacity of the retarding basins is 841,000 acre-ft.

Uniform capacity of the river channel through the cities is maintained by strict control and the project has been successful in taking care of heavy floods without damage to property or loss of life. Flood protection works are simply designed, and are completely foolproof. They work automatically—their success is not dependent upon anyone's judgment or act when floods come. The builders of the project recognized the tendency to forget danger when living in safety and on each of its dams erected a plaque, (Fig. 4). The injunction thereon has been followed implicitly for over twenty years and today Dayton, Ohio, is able to advertise itself as the "safest city of the world".

Another successful comprehensive flood control project is the Muskingum Watershed Conservancy District also located in Ohio. The drainage area of the basin is 5,692 sq. mi. The project is a combined channel improvement and retarding basin plan. The total gross capacity of the

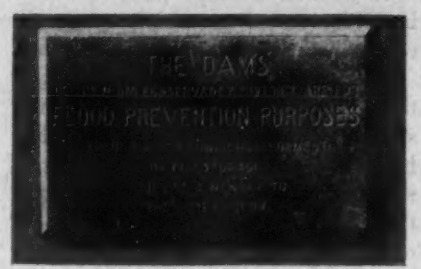



FIG. 4—Plaque mounted on each dam warns against perversion to purposes other than the original

flood control space behind the dams is 1,326,400 acre-ft. Storage capacity of 212,800 acre-ft. in addition to the flood storage has been devoted to water conservation and recreation purposes. The good distribution of the retarding basins above the area to be protected, the well designed structures and their successful operation, all indicate a well conceived plan that has been soundly built. The enterprise was initiated by the citizens of the Muskingum Valley, but was later taken over by the Army Engineers, and the bulk of the construction work was paid for by the federal government.

The Army Engineers have made wide use of the dry reservoir idea to protect limited areas. As far as is known, these projects have been successful, although some of them probably do not afford complete protection to the areas below.

### *No Panacea*

Dry retarding basins are not a panacea for floods. They are most effective for limited drainage areas. The storage capacity needed for larger drainage areas is very much greater than for the areas where the idea has been successful—the increase being all out of proportion to the increase in drainage area. The effect of the retarding basins on the crest of the floods decreases as the floods go downstream and finally disappears entirely. Then, too, an intricate "timing" problem is presented which becomes more and more complicated as the number of retarding basins are increased and the drainage area to be handled becomes larger.

An oversimplified example will illustrate the difficulty. Every river is fed by tributaries. During a heavy storm, these side streams also flood. But, generally, the crests of the floods on the lower tributaries reach the main stream before the flood from the headwaters gets that far and thus the water from the tributaries gets out of the way ahead of the main crest. If one of the lower tributaries has a retarding basin on it, the flood waters may be held back just long enough so that the crest may arrive at the main stream at the same time as the crest from upstream with the result that the flood level is much higher than it would have been if no retarding basin had existed. Thus, in planning a flood-control project involving reservoirs or retarding basins, great skill must be used in locating and determining the size of the component parts so that they fit together properly and perform their functions at the proper time and in the right order. A drainage area can be so large and involved that retarding basins are not practicable.

### *Lost Protection*

Another serious conflict exists between protection on tributaries of a river such as the Ohio, and on the main river itself. Floods on the tributaries are of short duration. The floods on the main river may last many weeks. If the water is held back in the basins on the tributary long enough to protect the main river, then the protection afforded to the lands along the tributary is lost, as experience shows that two or more floods can and do take place on the smaller drainage areas within a few days. The size of the basins required to fully protect the lands along the tributary, and at the same time hold back for long periods of time, enough water to give beneficial results on the main river, would be very great—far beyond the capability of the reservoir sites that exist in most basins.

# Diversified Customer Demands Found by Max-I-Meter Tests

***Tabulation of readings taken in continuous transformer-loading studies affords basis for determining diversified demands for three groupings of consumers—Transformer installations and computation check***

*M. M. DEVORRIS,* Pennsylvania Edison Co., Altoona, Pa.*

IN COMMON with all methods of determining secondary conductor size and transformer spacing in the design of distribution systems, the basic data required invariably involve an estimate or knowledge of the diversified demand per customer. Many methods have been utilized for obtaining these data. In each case the accuracy of the desired results and the available manpower are the important factors in choosing the method. Because the continuous use of Max-I-Meter equipment for obtaining transformer load tests covering a period of a week, has been the practice on our system since 1937, we have found it convenient and useful to tabulate the results of these tests for each transformer, and then compute the diversified volt-ampere demand per customer for each transformer. This is done by dividing the 30-minute integrated demand by the total number of customers served from the transformer.

Since the residential customers are predominantly 2-wire lighting, and 3-wire lighting and electric range customers, with a very small saturation of hot water heaters, it is quite obvious that the degree of range saturation would be a major factor in determining the level of the demand per customer. Realizing also that the diversity factor would be less for a transformer serving 50 customers or less, as compared with that for a transformer serving 50 to 100 customers, or one serving over 100 customers, we have divided our analysis into three groups:

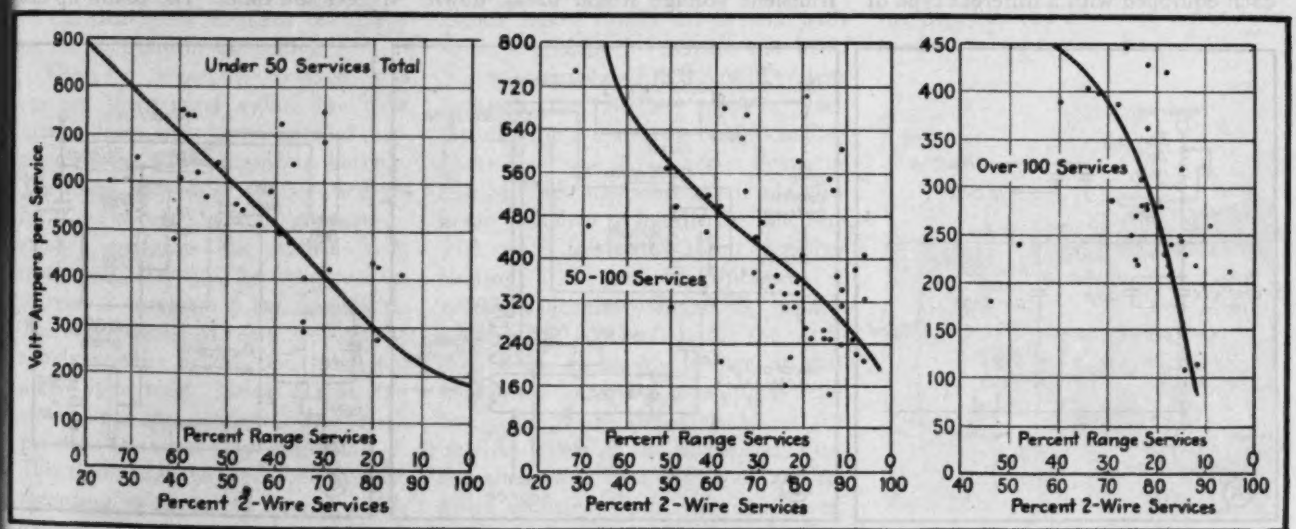
(1) Transformers serving 50 customers or less, (2) Transformers for 50 to 100 customers, and (3) Transformers serving over 100 customers.

It can be seen from the three accompanying graphs that the best results that can be expected from any such load analyses would be an average, or general trend line. This is clearly indicated by the variation of the points shown on the graphs.

Over a period of four to five years, check tests have been made on transformers which were installed on the basis of the diversified customer demand picked from these curves and a comparison of the actual 30-minute integrated demand with the computed demand indicates practical agreement.

It is thus quite possible to prepare working curves from such routine test data as are obtained through the use of Max-I-Meter, in carrying forward the regular schedule of distribution transformer tests without resorting to special load surveys.

* Transmission & Distribution Department




**DIVERSIFIED CUSTOMER DEMANDS plotted from one week's Max-I-Meter test** (2/28/38 to 10/1/40)

$$\text{Volt-amp. per Service} = \frac{\text{Transformer Kva. Metered Load}}{\text{Total Number of Services}} \qquad \text{Percent Two-wire Services} = \frac{\text{Two-wire Services per Transformer}}{\text{Total of all Types of Services}}$$

# Electronic Device Indicates Peak Transient Voltages

***Electronic scheme using trigger characteristic of gas-filled tube records presence of transient voltages having predetermined voltage peaks, also indicates reduction or damping out of the transient***

***TONY OFFENBACKER, Relay Engineer, Indianapolis Power & Light Co., Indianapolis, Ind.***

AN ELECTRONIC "peak transient voltage indicator" that employs the trigger characteristic of a gas-filled tube to indicate the presence of transient voltage at a predetermined level, was the special tool developed on the Indianapolis system to trace down and eliminate the cause of improper relaying on two power lines feeding from a local power station.

Value of this electronic "trouble shooting" device, origin and application of which will be discussed, lies not in measuring the amplitude of a transient voltage, but in establishing its presence or absence at any selected voltage level and in subsequently indicating the effectiveness of measures taken to damp out the transient.

### *Control Circuits Investigated*

The case of improper relaying referred to above occurred on two lines, each equipped with a different type of pilot wire relay. Both lines fed out of the same power station and both types of relays functioned to trip both ends of the line simultaneously for internal line faults. The false relaying consisted of breakers on these lines opening only at the power station end.

Since the false operation could not be associated with line trouble, or system disturbances, it was evident that something at the power station was causing that end of the line breaker to trip.

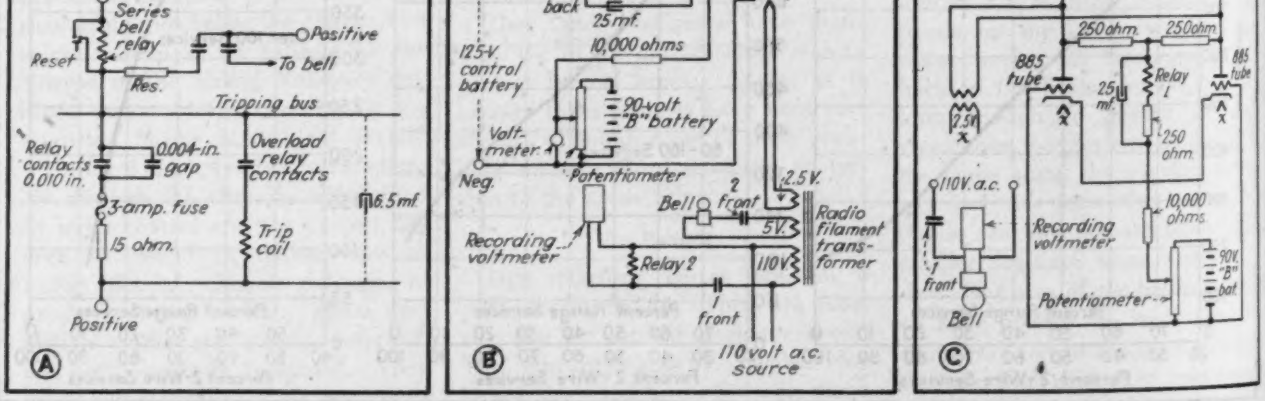
One theory was that transient voltages were being impressed on the station control circuits sufficient to break down the relay contact gap. It was believed the following power flow would cause the breaker to trip. Since the relay contact gap was 0.010 in., a 0.004 in. gap was put across the relay trip terminals so that any transient voltage would break down at this point and give an alarm. This arrangement is illustrated in the accompanying diagram (A) below.

After a few weeks the 0.004-in. gap broke down, definitely indicating the presence of some transient voltages. The curve, shown on following page, gives the relation between gap breakdown voltage and contact separation for the type of gap used.

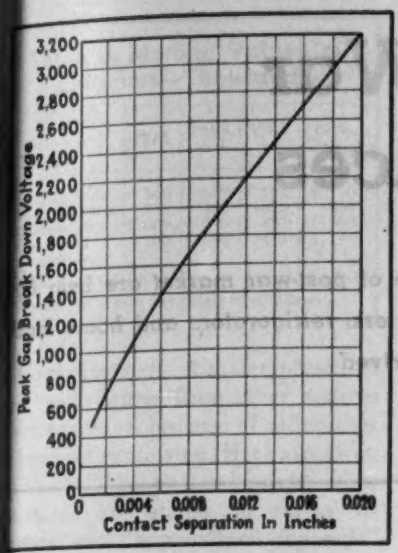
### *Transients Measured*

Several tests were made on the control circuit using a galvanometer-type oscillograph but nothing of a transient nature could be detected. It was then necessary to devise some other scheme to measure the number of occurrences and the maximum value of transient voltages.

By using the trigger characteristic of a gas tube, it was apparent that a transient voltage could be used to trigger the tube. The follow-up cur-




**RELAY CONTROL CIRCUIT (A) on which transient indicator was used. Dotted lines indicate subsequent condenser installation to damp out transients found in control circuit. Diagram (B) of original d.c. peak transient voltage indicator circuit. Circuit diagram (C) for an a.c. peak transient voltage indicator. Two tubes are required, one for each positive and negative half wave; principle is same as d.c. transient indicator**




**CURVE of gap breakdown voltage and contact separation for type of gap used**

rent could be used to indicate the occurrence and the number of operations per hour. Circuit for such a peak transient voltage indicator is shown in diagram (B) on the preceding page.

This indicator was designed to to operate from the 125-volt station battery that supplies the station control circuits. The characteristic of the 885 gas triode tube used required that $E_p = 10\ E_c$ to cause trigger action. $E_p$ is the plate voltage and $E_c$ is the grid voltage. With a grid voltage $E_c$ of minus 30 volts, a plate potential of plus 300 volts would be necessary for trigger action. Thus by adjusting the grid voltage with a potentiometer, an approximate value of transient peak voltages occurring on the plate can be estimated.

When a transient voltage has reached the trigger value, the tube breaks down and passes current supplied by the 125-volt station battery. The 25-mf. condenser charges and relay 1 picks up. A front contact on relay 1 energizes the graphic voltmeter and relay 2. The front contact of relay 2 energizes a bell for alarm. The back contact of relay 2 opens the supply voltage to the 885 tube and allows it to reset. Relay 1 will stay closed until the condenser has dissipated its stored energy into relay. 1. This time delay is used to allow the recording voltmeter to give a swing and to ring the alarm long enough to be recognized. The recording voltmeter is used only to record the number of operations per hour. Selection of tube grid potential determines the plate voltage—and thus the transient voltage—that will "fire" the tube.

Using this indicator set for 225 volts, the operation was very frequent. Operation of the station call bell, turbine governor control circuit was interrupted, especially when a sizable arc was made. With the indicator set for 325 volts only the call bell caused operation and with 450-volt setting the operation was two to three times daily. Using a 675-volt setting, no operation was recorded for two days.

### *Transients Reduced*

Having determined definitely that some of the control circuits were causing the indicator to operate, methods of reducing the transients to a low value were studied. A 6.5 mf. condenser was put from the tripping bus to the positive side of the battery, as shown dotted in first illustration. This size condenser effected a change such that the indicator could be set for 150 volts without operation.

Since control circuits and sensitive apparatus is used on alternating current, it was considered advisable to design a peak transient voltage indicator that would operate on alternating current. The principle of operation is the same but two tubes are necessary to get operation on the positive and negative half cycles. It is not necessary to interrupt the plate circuit after operation because each tube will automatically reset each cycle when the plate voltage becomes negative. Connections for this a.c. peak transient voltage indicator are shown in diagram (C).

The value of these peak transient voltage indicators, as has been previously stated, does not lie in ability to measure the amplitude of the transient voltage, but rather in their ability to indicate the presence of a transient voltage at a predetermined voltage level. They are useful also to indicate the effectiveness of any methods adopted for damping out such transient voltage on electric power systems.

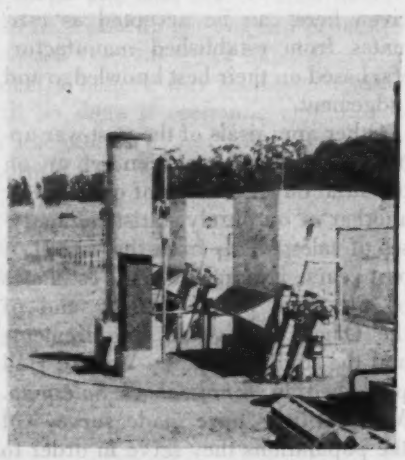
• • •

## Evaporative Cooler Instead of Cooling Tower

By E. W. OTTO,
*Designing Engineer, San Joaquin Div., Pacific Gas & Electric Co., Fresno, Calif.*

In place of a cooling tower, the Pacific Gas & Electric Co. used an evaporative cooler of the type shown for one of its outdoor synchronous condenser installations. This condenser has a closed air system with surface coolers to extract the heat. Water is circulated in a closed system through the surface coolers and through the evaporative coolers at 250 gpm. Two type 9Q7 Carrier evaporative cooling units were used, one unit being sufficient to handle the machine with nearly full load without excessive heating. This adds flexibility as it permits cleaning the coils in the evaporative coolers with the condenser in operation. Water at this location is hard, but cleaning is relatively simple as the scale is on the outside where it is accessible. Furthermore, this cleaning does not require shutting down the condenser, as would be necessary when cleaning the tubes of the surface coolers. Each unit requires 3 hp. to operate the fans and ½ hp. for the pumps which supply the spray nozzles. The losses in this machine are approximately 270 kw.

The installation has proved very satisfactory and obviated a bad scaling problem had a cooling tower been used.



**EVAPORATIVE COOLERS with closed water circulating system solve water scaling problem in synchronous condenser installation**

# Makers Estimate Post-War Sales of Major Appliances

***Widely different opinions as to size of post-war market are held by manufacturers of ranges, water heaters, refrigerators and home food freezers—Medians and averages derived***

*FRANK R. INNES, Associate Editor, "Electrical World"*

MANUFACTURERS of electrical appliances have widely diverse ideas as to post-war sales volumes of their products. There is closer agreement among them in regard to sales of ranges and refrigerators than of water heaters. As to home food freezers the extent of the post-war market seems to be anyone's guess. These conclusions are derived from examination of returns from an ELECTRICAL WORLD survey here presented.

Requests for estimates of national sales of electric ranges, water heaters, refrigerators and home food freezers in the three first post-war years were sent to 31 manufacturers of these appliances. Replies were received from 17. The replying group includes the best-known names in the appliance business and it may be asserted confidently that the group represents well over 80 percent of pre-war production of the four appliances covered in the survey. Thus the figures given here can be accepted as estimates from established manufacturers, based on their best knowledge and judgement.

Other appraisals of the post-war appliance market have been set up on potential buyer surveys of one kind or another or on purely statistical analyses of sales trends from the record of past years. Examples are the estimates of *Electrical Merchandising* and of the Office of Civilian Requirements and the studies made by Willard Hall published in *Wholesaler's Salesman*. Many utilities have made surveys of the populations they serve in order to establish bases for load building plans. Such information and cognate data on accumulated buying power, economic trends, competition for the buyer's dollar, employment prospects and many other factors—a veritable welter of facts, figures, estimates, forecasts and analyses—have been pored over and pondered long by appliance manufacturers in order to arrive at conclusions to determine their plans for post-war operations.

**Table I. Estimates of Post-War Sales—Thousands**

| 194X | 194X + 1 | 194X + 2 | 3-yr. Totals |
|---|---|---|---|
| | | *Ranges* | |
| 1,150 | 1,150 | 1,225 | 3,325 |
| 750 | 1,200 | 1,500 | 3,450 |
| 700 | 1,000 | 1,250 | 2,950 |
| 650 | 1,000 | 1,250 | 2,900 |
| 600 | 1,000 | 1,250 | 2,850 |
| 400 | 850 | 1,500 | 2,750 |
| 850 | 850 | 850 | 2,550 |
| 400* | 750 | 1,275 | 2,375 |
| 700 | 800 | 875 | 2,375 |
| 400* | 850 | 975 | 2,225 |
| 400 | 600 | 750 | 1,750 |
| | | *Water Heaters* | |
| 250 | 400 | 750 | 1,400 |
| 250 | 400 | 600 | 1,250 |
| 350 | 400 | 475 | 1,225 |
| 300 | 400 | 500 | 1,200 |
| 400 | 400 | 400 | 1,200 |
| 250 | 325 | 425 | 1,000 |
| 310 | 330 | 350 | 990 |
| 100 | 350 | 500 | 950 |
| 250 | 300 | 300 | 850 |
| 200 | 250 | 340 | 790 |
| 100* | 300 | 350 | 750 |
| 100* | 250 | 350 | 700 |
| 125 | 200 | 300 | 625 |
| 160 | 200 | 250 | 610 |
| 150 | 200 | 250 | 600 |
| | | *Refrigerators* | |
| 4,500 | 5,000 | 5,500 | 15,000 |
| 4,000 | 4,000 | 4,000 | 12,000 |
| 3,600 | 4,020 | 4,330 | 11,950 |
| 1,500* | 5,000 | 5,000 | 11,500 |
| 2,000 | 4,200 | 5,000 | 11,200 |
| 1,500* | 3,800 | 4,350 | 9,650 |
| 3,000 | 3,000 | 3,000 | 9,000 |
| 2,000 | 3,000 | 3,000 | 8,000 |
| 1,500 | 2,500 | 3,500 | 7,500 |
| | | *Home Food Freezers* | |
| 600† | 1,200 | 1,000 | 2,800 |
| 500 | 600 | 600 | 1,700 |
| 300 | 550 | 500 | 1,350 |
| 100* | 500 | 575 | 1,175 |
| 300 | 300 | 300 | 900 |
| 100* | 250 | 450 | 800 |
| 100 | 150 | 200 | 450 |
| 100 | 150 | 200 | 450 |

*No estimates given. Sales stated to be all that can be produced. To arrive at totals in these cases, 194X sales have been assumed arbitrarily as lowest figure of other estimates for the year.
†Reply was 500,000 to 700,000.

The individual estimates of sales of the four appliances are presented in Table I. Since these estimates are the resultants of judgment applied to possibly different figures, it should be permissible to combine them into expressions of medians and averages which would represent summations of judgments. Thus are compiled Tables II and III.

The closer agreements between median and average values of estimates of range, water heater and refrigerator sales in Tables II and III restate what is apparent from examination of the table of estimates for the individual appliances. The spreads between high and low estimates for these three are much smaller proportionately than the spreads between high and low for home food freezers. The highest estimates for sales of ranges in the three-year period is just slightly more than twice the lowest and in the case of refrigerators is exactly twice. Estimates of water heater sales show a somewhat larger spread, the highest 233 percent of the lowest. Home freezer sales, however, show a very wide divergence of estimates, the highest over six times the lowest. This divergence appears again in a comparison of median and average values of estimates. It is apparent that the post-war market for ranges and refrigerators is seen somewhat more clearly than the market for water heaters and that the future sales of home food freezers are seen only as through a glass, darkly.

**Table II. Median Values of Estimates—Thousands**

| | 194X | 194X +1 | 194X +2 | 3-yr. Totals* |
|---|---|---|---|---|
| Ranges | 650 | 850 | 1,250 | 2,750 |
| Water Heaters | 250 | 325 | 350 | 950 |
| Refrigerators | 2,000 | 4,000 | 4,350 | 11,200 |
| Home Food Freezers | 200 | 400 | 475 | 1,140 |

*Medians of totals, not totals of medians.

Comparison of estimates presented here with figures from other sources cannot be exact because of differences in terms of expression. Here are given figures for three-post-war years; other estimates are stated in terms of "needs" and "accumulated demands" without any reference to the period that may be required to meet them and without consideration of how much those needs or demands may be affected by intensity and quality of sales effort. A means for translating these figures into terms of sales estimates comparable with the data of the present survey is found in the relationship between estimates of "needs" and of post-war annual sales made by *Electrical Merchandising*. The comparison appears in Table IV, which, however, does not completely cover water heaters and home food freezers because of lack of data.

In the comparison with estimates from other sources in Table IV the medians and averages derived from Table I have taken on an appearance of validity that is not justified by their origins. It should not be forgotten that in spite of the fact of closer agreement among estimates of sales of ranges and of refrigerators than among estimates of water heater and home freezer sales, there are actually wide differences between manufacturers as to post-war sales of ranges and refrigerators.

Although from the evidence of Table IV, it seems that 2,750,000 and 10,500,000 could be taken pretty confidently as mean round figures for three-year post-war sales of ranges and refrigerators respectively, it should be kept in mind that they result from rather tortuous statistical manipulations and that the estimates of some manufacturers are quite different from them.

As to water heaters the only figures on which to base a consensus are the medians and averages. Some evidential weight can be given to the appearance that the 682,480 units of accumulated post-war demand, compiled from utilities' reports and published in *Electrical Merchandising*, is not irreconcilable with the median and average figures. One might hazard a guess of 800,000 water heater sales in the first three post-war years and feel reasonably sure that it was on the conservative side.

But there is nothing more than the widely various estimates of Table I on which to base a guess at post-war home food freezer sales. Little validity can be granted to either medians or averages of such ranges of estimates as these. Therefore, it appears that manufacturers of these appliances are preparing to sail out on a practically uncharted sea with only their native acumen and enterprise to guide them. Some light on the causes for the wide variation in estimates of sales of this appliance is given by a letter of one manufacturer:

"While I believe that 700,000 units would be a conservative estimate, I doubt that over a half million will actually be produced (in the immediate post-war period). Several factors will have a bearing on this production, such as the delay in W.P.B. red tape in setting up a suitable working plan for the industry and the continued control of critical materials. Also, there are very few manufacturers who will be able to produce cabinets without encountering some further reconversion obstacles that may slow up their efforts. If cabinets were available today, there is no doubt in my mind but that a million and a quarter to a million and a half home freezers could be sold."

It is of interest to compare the figures arrived at in this synthesis of estimates with those calculated by Willard Hall on his PAM (Potential Appliance Market) base and published in *Wholesaler's Salesman*, June,

**Table III. Average Values of Estimates—Thousands**

| | 194X | 194X +1 | 194X +2 | 3-yr. Totals* |
|---|---|---|---|---|
| Ranges | 636 | 914 | 11,556 | 2,700 |
| Water Heaters | 220 | 316 | 409 | 943 |
| Refrigerators | 2,622 | 3,836 | 4,287 | 10,622 |
| Home Food Freezers | 263 | 463 | 478 | 1,203 |

*Averages of totals, not totals of averages.

1944. Assuming that appliance sales will continue post-war from where they stopped after 1941, one takes Hall's projected figures for 1942, '43 and '44 as stating sales for the first three post-war years. The comparison is: Ranges, present consensus, 2,750,000, Hall's calculation, 2,568,698; water heaters, 800,000 and 696,952; refrigerators, 10,500,000 and 11,776,000.

General opinion expressed in letters accompanying estimates was that hold-over controls and restrictions, rather than sales efforts in the waiting market, will determine production and sales volume in the first post-war year.

### *First Post-War Year*

While other impressions and informations, not connected with the survey, indicate that sales efforts will be needed to dispose of even the restricted production of the first post-war year, it is foreseen that selling will really have to go "all out" in the second and following years. One letter says in underlined words, "Sales figures given for the second year *will not be easily* reached. If this volume is to be attained, *every* retail outlet will be forced to get out and promote and *sell*. On the other hand we confidently believe this selling can and will be done if economic conditions in the country are anywhere near 'normal'."

**Table IV. Comparison of Various Estimates of Post-War Markets—Thousands**

| | Medians of Totals* | Averages of Totals** | E. M. Estimates† | O. C. R. Estimates† | Reports of Utilities† |
|---|---|---|---|---|---|
| Ranges | 2,750 | 2,700 | 2,355 | 1,110 | 2,815 |
| Water Heaters | 950 | 943 | ..... | ..... | ..... |
| Refrigerators | 11,200 | 10,622 | 11,250 | 7,879 | 9,310 |
| Home Food Freezers | 1,140 | 1,203 | ..... | ..... | ..... |

*From Table II. **From Table III. †Calculated from estimates published in *Electrical Merchandising*, January, 1945. "E.M." figures are 3 times *Electrical Merchandising's* estimates of minimum annual sales for 5 post-war years. "O.C.R." and "Utilities" figures are developed from stated "needs" and "accumulated demands" on ratios between *Electrical Merchandising's* estimates of "needs" and annual sales.

# 230-Kv. Wood Pole Structure Design and Tests

***War conditions force use of wood structures for Bonneville 230-kv. transmission line—Valuable design data were secured from failure tests on typical structures—H-frames in 110 miles of circuit***

**A. A. OSIPOVICH*, Bonneville Power Administration, Portland, Ore.**

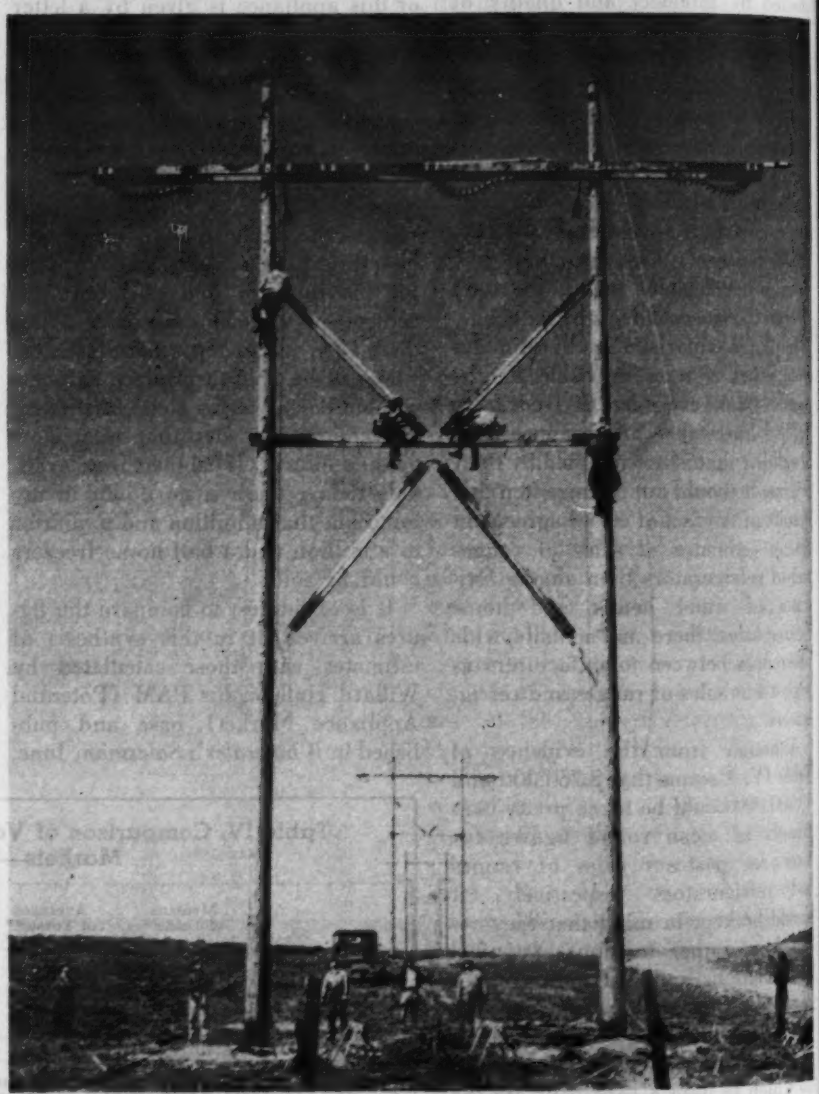
WHEN IT WAS decided that a second 230-kv. circuit must be built from Grand Coulee to the Seattle area in order to serve the highly important war industries located there, the Bonneville Power Administration was confronted with a serious design problem. This problem arose from the obvious necessity to conserve on the large tonnage of steel, which under ordinary conditions would have gone into the fabrication of nearly 850 towers required to support the high-strength 795,000 cir. mil ACSR conductors of this 183-mi. line.

Solution to the problem was found in the decision, approved by the War Production Board, to construct 110 mi. of the line, out of the total of 183, with wood-pole structures. By this decision a net saving was obtained of approximately 6½ million lb. of steel critically needed for other direct war uses.

### *Basic Design Considerations*

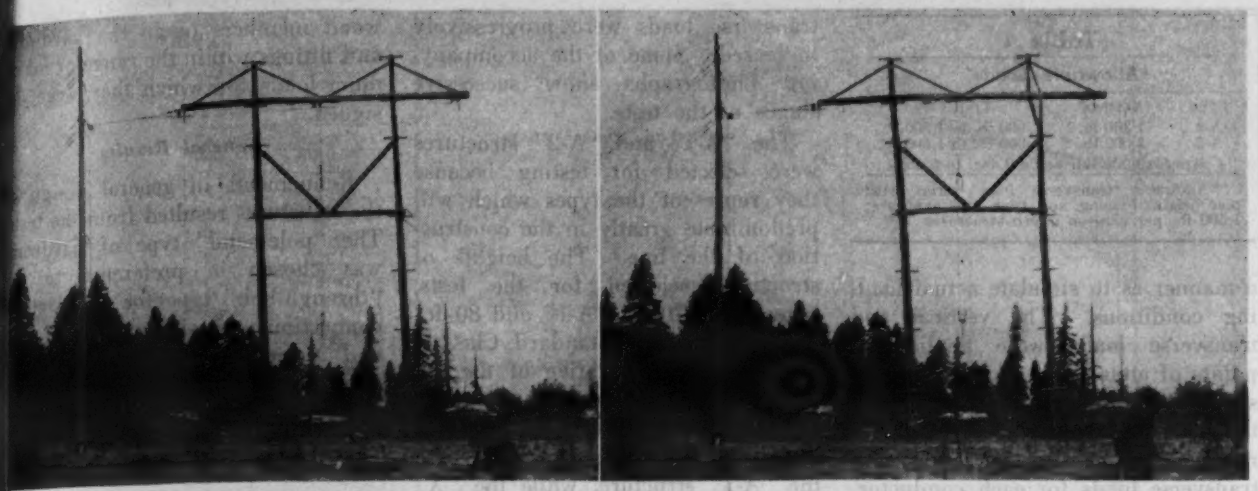
It was decided in the early stages of design that in order to replace steel towers effectively, the new 230-kv. wood structures would have to be of the H-frame type employing Western red cedar poles and that their crossarm assembly should be a truss employing for its principal members rectangular Douglas fir timbers. The decision to employ timber crossarms was influenced by the predominating design loading conditions (½-in. radial ice, 8-lb. wind at 0 deg. F.), the use of large diameter high-strength conductors and the nature of the terrain traversed by the line. All these conditions combined to impose heavy loads upon the crossarms which could not be economically carried by other types of wood crossarm, such as a spar arm for example, a single plank crossarm, or a partially trussed arm.

The phase spacing in the horizontal configuration of the 230-kv. wood structures, the spacing of poles, the resulting total length of the crossarms, and their ultimate design were



**ERECTING WOOD POLE STRUCTURE** of the "X" brace type on Coulee-Covington 230-kv. line. Next structure in the background shows use of "K" brace

* Chief, Transmission-Design Unit.



**FULL SCALE FAILURE TESTS WERE MADE** to check design of 230-kv. wood structures. (Left) Type "A-1" structure with "K" brace. 70-ft. ASA Class II poles and two ½-in. S.M. side guys. Test loading, 1,500 lb. per phase vertical and 1,500 lb. per phase transverse. (Right) Same structure. Failure occurred by splitting of pole which was under tension. Loads applied at time of failure were 1,500 lb. per phase vertical and 5,500 lb. per phase transverse

determined by the minimum amount of insulation established with due consideration to the insulation properties of wood and by the basic requirements of the National Electric Safety Code.

The general arrangement and details of the resulting basic structures are shown in Fig. 1. Combinations of vertical and transverse loads for which the basic structure types were finally designed are given in Table I on the next page.

### *Full Scale Tests*

In view of the newness of the design, and particularly because of the importance in the BPA system of the line upon which the newly designed wood structures were to be used, it was decided to subject the basic structures to a series of full scale tests. These tests were arranged and conducted to serve a number of purposes. First, because H-frame structures of wood design, arranged with either "K" braces or "X" braces, are statically indeterminate, it was decided that a reliable check of the design characteristics of these structures could most economically be obtained only through actual tests. Secondly, it was agreed that in the process of erecting the test structures it would be possible to observe the suitability of hardware, fittings and sub-assemblies originally projected, and to modify or improve them as test results would indicate. Thirdly, the very methods of structure erection could best be developed and proven, even to determining the use of auxiliary tools and equipment.

The basic question as to whether or not it would be most economical to first assemble the entire structure on the ground and then raise it as a whole into place, or to follow the method of first setting the poles and then raising the crossarm and brace assemblies into place, could be checked in a general manner in the course of the tests. The effect of guys on the strength of the structure, as well as the methods of installing guy anchors of the proposed "explosion" type and their strength, were determined and checked during these tests. Many secondary problems, unforeseen when the tests were decided upon and begun, came to light and were conveniently answered in the course of the full scale tests in the field.

Equipment used in conducting the tests and its arrangement are shown in the diagrammatic perspective of Fig. 2. The predetermined test loads were applied to the structures in such

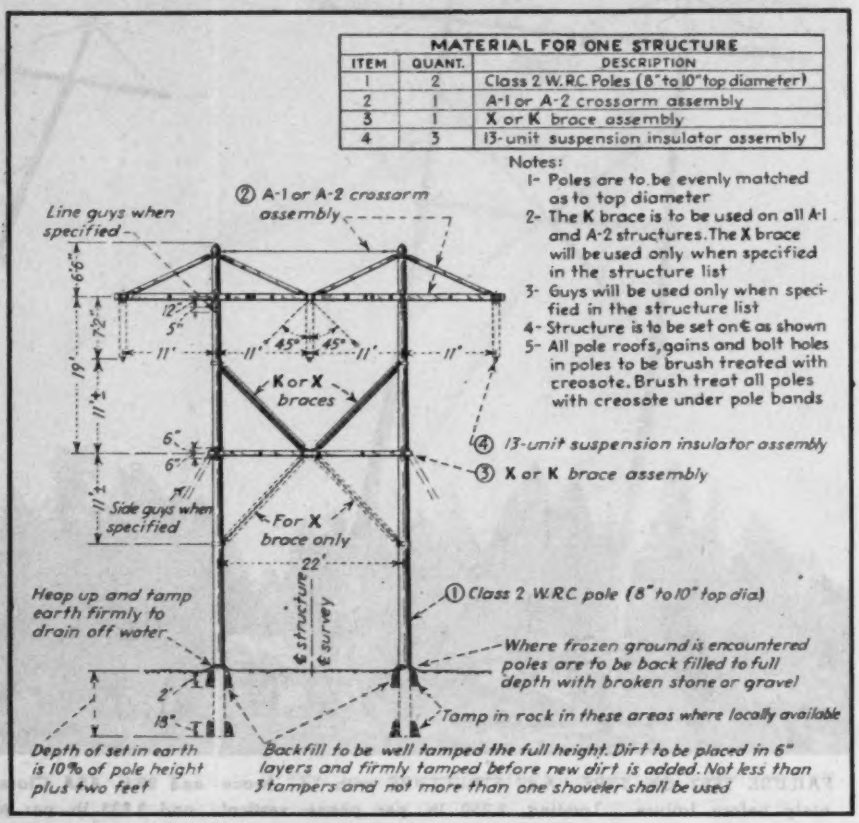

MATERIAL FOR ONE STRUCTURE
ITEM | QUANT. | DESCRIPTION
1 | 2 | Class 2 W.R.C. Poles (8" to 10" top diameter)
2 | 1 | A-1 or A-2 crossarm assembly
3 | 1 | X or K brace assembly
4 | 3 | 13-unit suspension insulator assembly
Notes:
1- Poles are to be evenly matched as to top diameter
2- The K brace is to be used on all A-1 and A-2 structures. The X brace will be used only when specified in the structure list
3- Guys will be used only when specified in the structure list
4- Structure is to be set on ℄ as shown
5- All pole roofs, gains and bolt holes in poles to be brush treated with creosote. Brush treat all poles with creosote under pole bands
② A-1 or A-2 crossarm assembly
Line guys when specified
K or X braces
④ 13-unit suspension insulator assembly
③ X or K brace assembly
Side guys when specified
For X brace only
① Class 2 W.R.C. pole (8" to 10" top dia)
Heap up and tamp earth firmly to drain off water
℄ structure
℄ survey
Where frozen ground is encountered poles are to be back filled to full depth with broken stone or gravel
Tamp in rock in these areas where locally available
Depth of set in earth is 10% of pole height plus two feet
Backfill to be well tamped the full height. Dirt to be placed in 6" layers and firmly tamped before new dirt is added. Not less than 3 tampers and not more than one shoveler shall be used

**FIG. 1—Wood pole H-frame structure type "A-1" and "A-2"**

**Table 1**

Allowable Loads*

| Type | Vertical | Transverse |
|---|---|---|
| A-1 | 1,300 lb. | 600 lb. to 1,500 lb. |
| A-2 | 2,000 lb. | 600 lb. to 1,500 lb. |

Approximate line angle 0 deg. to 5 deg.

* Allowable transverse load varies with pole height, bracing, soil type and exposure; 1,500 lb. per wire on guyed structures.

a manner as to simulate actual loading conditions. The vertical and transverse loads were applied at points of attachment of the insulator strings by means which assured that the resultant load at each point represented the combined vertical and transverse loads for each conductor.

The basic loads for which the tested structures were designed and the progressive loadings used in each of the series of tests are shown in Tables II, III and IV. It will be noted from these tables that the first tests in the series for each structure were for the primary purpose of checking the strength of the crossarms. These were followed by tests under combined vertical and transverse loads; during these tests the vertical loading on each phase remained constant at a value somewhat greater than the maximum design load, while the transverse loads were progressively increased. Some of the accompanying photographs show successive stages of the tests.

The "A-1" and "A-2" structures were selected for testing because they represent the types which will predominate greatly in the construction of the line. The heights of structures selected for the tests, namely the 70 ft., "A-1" and 80 ft., "A-2," using ASA Standard, Class II poles, are representative of the average wood structures to be used on the Covington-Coulee line No. 2. The so-called "K" brace was used with the "A-1" structure, while the "X" brace was used with the "A-2" structure during the tests. Actually, either type of brace is used interchangeably with any of the structure types depending upon the height of the structure and the nature of span and loading served by it.

The test structures were set in sandy loam. Pole holes were dug with a boring auger to standard ASA depths. The usual method of hand tamping was used in setting the poles. It is noteworthy that the structures tested showed no serious evidence of weakness or failure, either in their wood members or in the hardware and fittings within the range of maximum loads for which they were designed.

### *General Results*

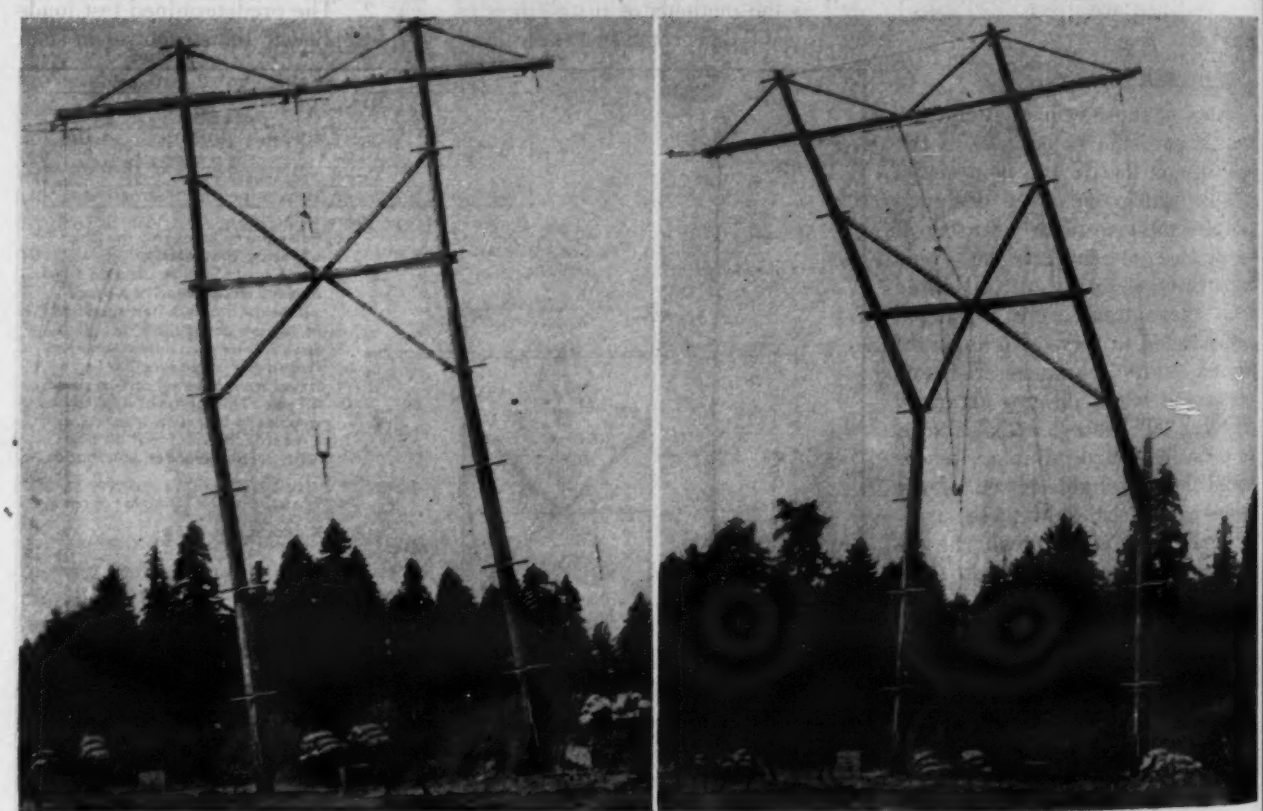
Refinements in general design of the structures resulted from the tests. The "pole-band" type of hardware was chosen in preference to the "through-bolt" type for all diagonal connections. A single "toothed ring and through-bolt" connection was adopted for attachment of all horizontal members to poles. Conventional four-piece bands were selected for use with the diagonal members

**Table 2**

Test Loading
Type A-2 Structure, 80-ft. Poles with "T" Brace

| Test No. | Vertical Load Lb. Per Phase | Transverse Load Lb. Total |
|---|---|---|
| Design Loads | 2,000 | 4,500 |
| 5* | 3,300 | 3,000 |
| 6** | 3,300 | 4,500 |
| 7 | 2,250 | 4,500 |
| 8 | 2,250 | 9,000 |
| 9 | 2,250 | 10,000 |
| 10 | 2,250 | 11,000 |
| Str. Failed*** | 2,250 | 11,500 |

* Test No. 5 — Tipping noted in pole bands at top of pole — pulled down ½ in.
** Test No. 6 — Pole bands tightened. Bending of ears noted — bolts bent
*** Compression pole failed below lower connection of "X" brace.



**FAILURE TEST ON TYPE "A-2" STRUCTURE with "X" brace and 80-ft. ASA Class II poles. (Left) View was taken immediately before failure. Loading, 2,250 lb. per phase vertical and 3,833 lb. per phase transverse. (Right) Immediately after left hand view, showing failure to have occurred in compression pole. Failure of tension pole resulted from failure of other pole**

**Table 3**

**Test Loading**
**ype A-1 Structure, 70-ft. Poles with "K" Brace**

| Test No. | Vertical Load Lb. Per Phase | Transverse Load Lb. Total |
|---|---|---|
| ign Loads | 1,300 | 4,500 |
| | 2,250 | 3,000 |
| | 2,250 | 4,500 |
| | 1,500 | 4,500 |
| | 1,500 | 6,750 |

Under Test No. 8 the undersized diagonal mber of "K" brace failed in compression. Structure rebuilt with revised details at center "K" brace and revised poleband hardwere and aption of one bolt and toothed ring at connection horizontal member and pole. Three different isions of hardware were made and tested in ts Nos. 9 to 19 Inc. Final Revision of hard- re the adaption of so-called "Flexible and justable".

f the crossarm truss at the top of e pole.

Cross arms, splice-blocks, braces nd fittings were finally designed with view towards economical mass brication, ease of assembly both on e ground and in the air, and with lequate provisions for adjustments ue to variations in sizes of poles, or construction tolerances. Particu- r attention was paid to provisions hich would enable ground crews to reassemble crossarms and braces rior to their final erection in the air, us permitting progressive schedul- g and economical construction.

### *Anchors*

"Explosion" type anchors proved uring the tests to be an easy, eco- omical and reliable installation in verage soils. The tests led to the onclusion that use of fast acting 40 ercent dynamite will result in well acked and uniformly sized anchor oles.

The Covington-Coulee line No. 2, ompleted and energized on October , 1944, 24 days ahead of schedule, as built primarily by the forces of

**Table 4**

**Test Loading**
**ype A-1 Structure, 70-ft. Poles with "K" Brace**
**tructure Rebuilt Incorporating Revised Details—Side Guys Added**

Pole Band Tests as Follows

| Test No. | Vertical Loads Lb. Per Phase | Transverse Load Lb. Total |
|---|---|---|
| pe | 1,500 | 3,000 |
| | 1,500 | 4,500 |
| | 1,500 | 6,000 |
| | 1,500 | 6,750 |
| | 1,500 | 8,000 |
| | 1,500 | 10,000 |
| | 1,500 | 12,000 |
| ge* | 1,500 | 14,000 |
| oads after failure | 1,500 | 16,500 |
| | 1,500 | 12,000 |

Tests Nos. 20 to 28 incl. made with two ½-in. M. guys attached 18 in. above and below connec- ion of horizontal member of "X" brace and pole.
** Structure failed by splitting pole at point of onnection of crossarm. After failure structure withstood the loads indicated.

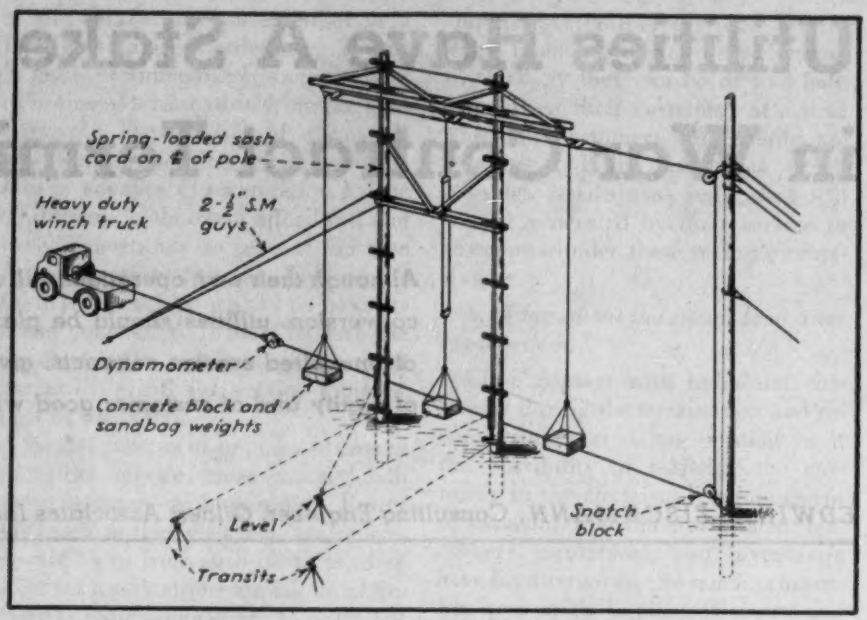
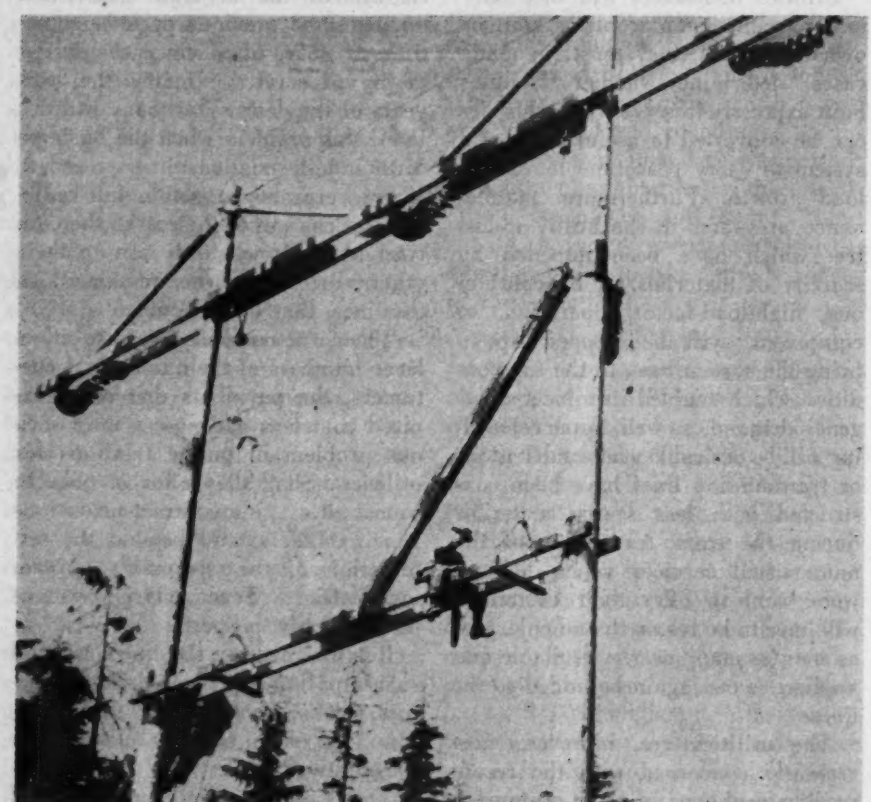



**FIG. 2—Set-up for failure tests on 230-kv., H-frame wood structures**

the Bonneville Power Administration. For administrative reasons, the line was divided into three sections, each being constructed by a different crew. The relative merits of the construction methods employed on each section of the line, as well as the resulting erection costs, were watched with interest as they undoubtedly will offer useful data in planning future projects of similar nature.

Members of the Transmission-Design Unit of BPA largely responsible for the design of the 230-kv. wood structures, as well as for the testing installation and procedure, are F. W. Farr, M. N. Marjerrison and R. B. Pemberton.



**"K" BRACED TYPE "A-1" 70-ft. structure being completed. Crossarm had been pre-assembled on ground and insulator strings attached before assembly was hoisted into position. Crew is completing installation of the "K" brace ground-assembled**

# Utilities Have A Stake in War Contract Terminations

***Although their own operations will not be largely affected by industrial conversion, utilities should be planning how to handle the problems of unexpired service contracts, giving proper weight to consideration of equity and of customer good will***

***EDWIN FLEISCHMANN, Consulting Engineer, Gilbert Associates Inc., New York, N. Y.***

AS FAVORABLE war conditions permit government contracts for war goods to be cancelled, and manufacturers to turn again to their peacetime markets, they will have to change their plants over to civilian production, clear out government tools and inventories, rearrange production lines and begin to deal with many customers instead of just one.

Utilities themselves will face only minor reconversion problems. In their own operations, they must, in many cases, determine whether facilities built expressly to serve war industries can be converted to useful parts of a system to carry peacetime loads and load growth. Furthermore, maintenance programs in the utility industry, which have been impeded by scarcity of materials, or by continuous high-load-factor operation of equipment, will be stepped up to bring the system back to the top condition which enabled it to meet emergency demands so well. Some rebuilding will be desirable where substations or transmission lines have been constructed with less scarce materials during the war. And some of the more usual services which utilities were wont to offer their customers will have to be restored, and enlarged, as soon as manpower is available and appliances can again be added to the lines.

The utilities are, however, most seriously concerned with the reconversion problems of their customers. When industrial reconversions come in volume, industrial power use will decline. Four important groups of problems and opportunities will face the utilities in their relations with their industrial customers.

1. *What about reduced taking of electricity under existing contracts?*

Almost all industrial electric rates contain some sort of ratchet provision, which states that the demand, for which a charge is made, shall never be considered as less than some percentage of the demand established during some previous period—sometimes a year, often since the initial taking of service. During the lean years of the depression many utilities faced this problem when the business of their industrial customers receded. Many were able to obtain full settlement of charges to the end of the contract term. It was only fair to their other customers, who remained on the lines, that they should.

When war cutbacks begin to affect large numbers of their industrial customers, the payments due on unexpired contracts will pose a most serious problem in public relations for utilities. Shall they offer at once to cancel all existing contract provisions which might extend beyond the termination of the customer's government order? Several large systems have already proposed this.

But where draw the line? Should such a policy apply to prime contractors, sub-contractors, sub-sub-contractors, and so on, or only to the upper tier or two?

The Contract Settlement Act of 1944 provides an answer which suggests that, if utility rates, based on demand charges for the use of capacity over some contract period, are properly grounded on cost of providing the facilities for that period, such charges may be paid by the government. It is altogether probable that electricity may be considered a "material" within the meaning of Section 3(e) of the Act. If this is so, then the utility is itself a sub-contractor whenever it serves a prime or sub-war-contractor.

It should be pointed out that only such demands as were established exclusively in the performance of the terminated contract will be considered as costs in termination proceedings. Thus, a utility contract with a plant erected wholly for war work on the terminated contract, which is useless in the normal operation of the customer's business, might well qualify. On the other hand, it would be unfair to expect the government to pay charges for unused demands during the shut-down of a contractor's plant for reconversion, when his expected demand after reconversion is substantially that created during his war work, or when his pre-war demand was about the same as that during performance of the war contract.

The Act* authorizes the government contracting officer to delegate to prime contractors the right to settle claims of their sub-contractors. The new Joint Termination Regulation**, a uniform procedure for use by both Army and Navy, limits such unreviewed settlements to $10,000 per sub-

* Section 7(a)

** Joint Termination Regulation Section VI, Part 4, Par. 642

ntractor. For many utility service ntracts, the amount due for demand arge balances will probably not ex- d this amount, so that their bills be paid without question by the me contractor, and in some cases the first tier sub-contractor. It is essary, however, for a claim to be sented to the utility's customer, so can use this statement to substanti- his own settlement.

Contract terminations with govern- nt facilities themselves, such as in- ction centers, arsenals, etc., are in different class. Many of these are rved on special contracts which con- in amortization provisions cover- the temporary installation made the utility. They may also contain ncellation provisions within them- ves. They are, however, relatively w in number compared with the ousands of contracts with contrac- rs and sub-contractors all over the untry, and they may be settled in- vidually by negotiation, without rious trouble or danger of import- t discrimination against other cus- mers.

*2. How will such a policy affect the oblem of renegotiation of power ntracts?*

It does not seem probable that the sistence on termination payments, provided by law, will affect the estion of renegotiation which is w facing many utilities. All power ntracts with government facilities r 1,000 kw. or more and with war ntractors and first tier sub-contrac- rs are held to be subject to renegoti- ion. The adherence to the terms of e rate and contract under which rvice is rendered should, in fact, ace on a sounder basis the rene- otiation, when and if it is under- ken.

Contracts with sub-contractors be- w the first tier are not subject to re- gotiation, so that the question does t arise in the vast majority in num- r of termination settlements.

*3. How may contract termination oblems be brought to the attention utility customers?*

In order to obtain settlement of arges for unexpired portions of the ntract term to the extent that such arges relate wholly to the war work, e utility's customer must include ese as post-termination charges con- cted with the winding-up of his war ntract. It is important that such tuations be brought to the attention of the contracting officer either at a Pre-Termination Conference, if one is held, or immediately upon receipt of notice of termination from the government. The practice of discussing and settling problems with contractors in advance of termination by the conference method will afford full and early opportunity to present the case for valid utility charges. This means that, if the utility wishes to have its claim considered, it must be sure the contractor (its customer) knows that the utility's bill for service must be part of his claim.

In this case, as in so many instances in utility service, close contact with the customer is important. Power salesmen, as they visit their customers, should know from such contacts when contract terminations are taking place. Here is their opportunity to point out to the customer the provisions of the law applicable to payments to sub-contractors (such as the utility) and to cooperate with the contractor-customer in making sure that the latter's claim includes the applicable utility charges.

It is most important that the problem be approached in this way and at this time. Otherwise, the contractor, having neglected to include his power costs in his claim for post-termination expenses, may be faced with additional billings by the utility after settlement has been made by the government. Nothing but ill-will toward the utility will result in such a case.

There are, furthermore, many small utility customers, who have been doing war work, and who will, when terminations come, be wholly unfamiliar with how to go about getting termination payments from prime contractors or their next tier sub-contractor; and how to arrange a Termination Loan to finance their reconversion if they need it.

Unlike some of the wartime governmental procedures, filing termination claims and obtaining Termination Loans are quite simple. Uniform forms for Settlement Proposals have just been issued by the Office of Contract Settlement for use by all of the agencies of the government. It is suggested that power salesmen be given a brief outline course in the methods, forms and procedures to be followed in the filing of claims for termination and post-termination charges, the procedures for clearing the plant of government inventories and machinery, and the availability of loans for interim financing during reconversion. In this way they can be of real help to many of their customers at a time when the customers will greatly appreciate it. If the instruction of the salesmen is adequate, only good will can be generated by their service to customers under these trying circumstances.

*4. What about industrial load after reconversion?*

Close contact with industrial customers during the termination and reconversion period has implicit in it the possibility of assisting the customer in the electrical rearrangement of his plant, after the government machinery, equipment, and inventories have been removed. So much progress has been made in plant efficiency and planning that customers are sure to want more direct-electric-drives on machines, vastly improved lighting, much more electric industrial heating equipment, more electronic controls, and many other automatic devices from which the wide-awake manufacturer has benefitted during the war, and with which the live power salesman will be wholly familiar. Reconversion offers an opportunity for modernization in many plants, which can only result in increased use and usefulness of electricity in the industrial group of customers, if it is properly promoted and encouraged.

Utilities may thus face the period of contract terminations with considerable confidence and hope. They should, however, prepare themselves and their staffs to take full advantage of the situation:

(1) By setting clear and logical rate policies on contract cancellations, after considering all of the facts surrounding war contract termination;

(2) By training their power salesmen in these policies and in how to gain good will in their application;

(3) By a careful course of instruction for power salesmen and industrial contact personnel in the fundamentals of government contract termination procedures, property disposal and termination financing; and

(4) By strengthening the sales force with expert technical assistance which can be made available to war contractors to help them in planning the electrical layout of their plants during reconversion to civilian production.

# Practical Methods for Locating Faults in Non-Metallic Cables

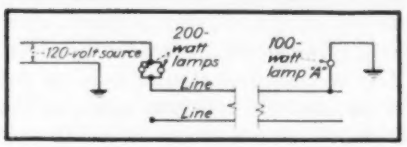
***Fault location equipment and procedures developed at Civil Aeronautics Administration Experimental Station speed identification and spotting of faults in essential airport power cables***

*M. S. GILBERT*, Civil Aeronautics Administration, Indianapolis, Ind.*

INCREASING USE of underground cables at civilian airports for instrument landing systems, approach and contact lighting installation and to serve radio and other buildings, in the last few years, has brought with it the problem of determining the types and locations of cable failures on high-voltage underground power lines.

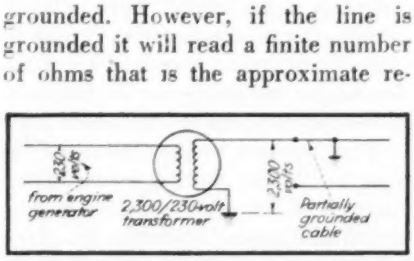
Methods, techniques and equipment for identifying and locating various types of faults on *unshielded* underground cables, described in this article have been developed from failures experienced on rather extensive cable systems installed in connection with development projects at the Civil Aeronautics Administration Experimental Station, Indianapolis. These methods, developed for non-metallic cables, do not necessarily apply to fault location in lead-encased or steel-taped cables.

Since slightly different techniques are required for locating the various kinds of faults that cause trouble on underground cables the type of fault should be determined first. Faults can be of two principal types; short circuits between several conductors in a cable and high-voltage or low-voltage grounds. A high-voltage ground may be defined as one that will carry current at low voltages but break down under high voltages. A low-voltage ground is one in which the cable is well grounded at the fault and consequently breaks down under both low and high voltage. Usually an underground cable will be found to be both short-circuited and grounded. Heat, generated by a sustained short circuit, will usually burn off the insulation between a conductor and ground thus creating a ground as well as a short circuit.




**LAMP TEST for determining presence of ground on underground power cable. With 200-watt lamps connected in series-parallel in hot side of 120-volt test source, the 100-watt test lamp "A" will burn dim or not at all if cable is grounded or open or both**

Methods of identifying the various types of grounds, although conventional, will be reviewed briefly. In the absence of test instruments a short circuit between two conductors may be identified by connecting a small lamp in series with a 120-volt source and the exposed cable conductors at either terminus. If the lamp burns the fault is obviously a short circuit. A resistance measurement applied across both conductors will read nearly zero resistance for a short circuit. Between one conductor and ground it will show infinite resistance if the line is not grounded. However, if the line is grounded it will read a finite number of ohms that is the approximate resistance of the ground-return current path.




**DISTRIBUTION TRANSFORMER connections used to break down cable insulation at point of fault and force development of low-voltage ground. This step is preparatory to locating fault with exploring loop**

Another practical test, in the absence of instruments, is to apply 120 volts between ground and one cable conductor, running the "hot" side through several 200-watt lamps in series-parallel, as shown, to provide a large test current. At the other end of the cable connect a small lamp between ground and the "hot" wire. If the lamp burns dim or not at all, the cable conductor is either grounded or open or both. However, if it burns brightly that particular conductor is sound and the test should be repeated for the other conductor.

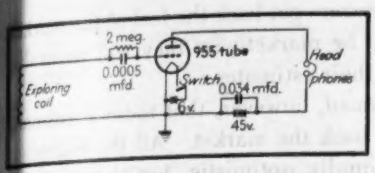
However, if the above tests show the cable to be neither short-circuited nor grounded, yet fuses continue to blow when a 2,300 volt potential is applied, the trouble is obviously a high voltage ground.

### *Breaks Down Insulation*

Fault location in a multiple conductor cable can be speeded by breaking down the insulation sufficiently to force a low-voltage ground to develop at the fault point.

At the CAA Experimental Station a 5-kw., 230-volt gasoline engine generator is used for this purpose together with a 2,300/230-volt transformer. One terminal of the transformer 2300 - volt winding is grounded, and the other is connected to the partially grounded conductor. Low voltage from the generator is applied to the transformer 230-volt winding and gradually built up until 2,300 volts is impressed between ground and the cable conductor. After a few minutes of high voltage, current should suddenly increase, indicating

*Airport Engineer, U.S. Dept. of Commerce, Civil Aeronautics Administration Experimental Station.




SCHEMATIC DIAGRAM of exploring coil and electronic signal detector

that the cable insulation has broken down. A Megger ground tester subsequently applied should show a ground and possibly a short circuit. It should now be possible to locate the trouble with an exploring loop.

### *Use Exploring Loop*

A satisfactory exploring loop, of the type used at the CAA Experimental Station can be made from a 24-in. diameter hardwood wheel (rim of a racing sulkey or bicycle wheel). Around the rim is wound about 4,500 ft. of No. 36 silk-covered copper wire, to form the detector coil. This coil is connected to a small amplifier using a grid leak detector circuit with a 6-volt "A" battery and a 45-volt "B" battery and a set of head phones. The circuit is diagrammed. A conventional automobile spark coil can be used to impress a signal between the faulted conductor and ground. With the loop held near the ground the operator walks along the line of the cable listening for the signal. It will be loudest when directly above the cable and when the loop is in the plane of the cable.

If the cable is grounded the signal will stop or fade out approximately at the fault. This spot can be checked by putting the signal on the line from the other end. If it fades out at the same place the fault is located.

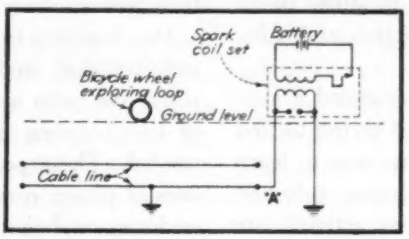
Usually the signal fades out toward the end of a good cable. Thus, if the fault is near the end of the line, it might be rather difficult to find by this method. Generally, however, faults can be located within plus or minus 1 ft. even though cable is buried 30 in.

When line resistance cannot be broken down lower than about 5,000 ohms to ground and there is a substantial resistance, say 20,000 ohms between conductors, it has been found that the high frequency spark coil signal will travel beyond the fault and make location inaccurate. In such cases it is helpful to change from the spark coil to a single 60-cycle signal applied between line and ground in the same manner as in breaking down the line.

As location of the trouble is narrowed down the operator should go over the section of line very carefully with the loop, listening for variation in tone and remembering that the signal will sometimes die out near the end of a good line. It may also fade at sharp bends in the line. Any places giving questionable change in sound should be probed and particular attention paid to places where old splices are known to be.

### *Bridge Limitation*

The Wheatstone bridge is not the best tool for locating faults in non-metallic sheath cable. The bridge can only be used when there is one good line and one well-grounded line (one having a ground resistance of three or four ohms or less) without an open




SPARK COIL SIGNAL generator and exploring loop as used in locating faults on non-metallic sheath underground cable buried to a depth of 30 in.

circuit. In this case an exploring loop would probably also be required for locating the cable itself. A ground of three or four ohms is not usual with non-metallic sheathed cables and the insulation resistance would have to be broken down before the Wheatstone bridge could be used. Moreover, the bridge method is theoretical and subject to errors of 30 ft. or more while the signal and exploring loop method is an exact method that will locate the cable, an open circuit or a ground within a foot or two.

### *Portable Radio*

Lacking other apparatus, a skilled operator can often find grounds with a small portable radio set substituted for the loop. In the absence of any other signaling device, the grounded line may be connected to a spark plug of an automobile and the motor left running to give the signal. These methods are useful in locating either a fault in a cable or the position of a good cable.

It is a good idea when installing long cable runs of several thousand feet or more to place cut-outs at intervals over the circuit so that the cable can be sectionalized and a signal placed at either end of a section to facilitate fault location.

In general, either the methods outlined above or variations of them will suffice to locate the sources of cable failure, and with enough practice one can quickly solve cable problems as they develop.

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## War Conditions Slow Transformer Turnover

Accompanying data on the rate of transformer turnover on the 2,300 and 6,900 volt system of Kansas City Power & Light Co. prior to and during the present war reveals the effect that the wartime shortage of transformers has had in lengthening the operating interval between regular shop overhauls.

Using 1939 as a base these data show that the period of time that transformers remain in the field before removal for shop test and reconditioning has increased 63 percent during the war for the 2,300-volt system and 66 percent for the 6,900-volt system. The 1944 data for the 2,300-volt system is based on 7,286 transformers, aggregating 132,156 kva., installed in 5,838 transformer stations and for the 6,900-volt system on 2,196 transformers aggregating 13,415 kva. installed in 2,161 stations.

The turnover period given in the table was obtained by dividing the number of transformers in the field as of December 31, 1944 by the number of removals during 1944. The Kansas City utility in the past has followed the practice of arbitrarily limiting the time that transformers remain in the field to 20 years. Of late this plan has not been pursued to the extent formerly done due to wartime conditions.

**Transformer Movement Slowed By War**

| Year | Turnover Period 2300-V. System | 6900-V. System |
|---|---|---|
| 1938 | 11.0 Years | 11.6 Years |
| 1939 | 10.3 " | 11.6 " |
| 1940 | 11.0 " | 9.6 " |
| 1941 | 10.2 " | 7.7 " |
| 1942 | 14.3 " | 15.8 " |
| 1943 | 16.0 " | 21.1 " |
| 1944 | 16.8 " | 19.3 " |

# Editorials

S. B. WILLIAMS, *Editor*

## *Appliance Sales Estimates*

MARKET SURVEYS are familiar phenomena. Scientific exploration of economic trends, conditioning factors, distribution of income, ability to buy, public reactions, are essential to a manufacturer of consumer products under normal conditions in order to plan production and sales. Do these rules hold today?

In this issue of ELECTRICAL WORLD is presented a market survey with reverse English. Instead of trying to find out what buyers maybe might buy, the aim was to learn what sellers think they can sell. Production volumes, on which depend employment and business activity, are fixed by sales estimates. And sales estimates result from appraisals of potential markets. In the electric appliance field, as in practically all others, there have been market studies of every kind, type, stripe and flavor. Their findings have been as diverse as their methods various. It was the job of those who intend to supply the market to make their production plans from these different informations. And no matter how many appliances the surveys said the people would be willing to buy, no more would be sold than were produced. It was the intention of the present inquiry to discover, if possible, how many of certain appliances, important to utility load building plans, are expected to be sold and, prerequisite, to be produced.

Unless one is willing to accept medians or averages of widely different figures, it must be said the inquiry was a failure; there is no discovery in definite terms of how many of these certain appliances will be produced. On the other hand, the inquiry was a success if it did nothing else than emphasize the fact that during the war the entire industry has lost its feel of the market. There is nothing now with which to gage a market, to weigh buying power, to understand consumers' needs and desires—and there won't be until the goods come on the market. Before the war manufacturers knew the capacities of their retail outlets. They knew the men who were their distributors. They knew what they had to do to sell an increased volume of a certain percentage. They knew the effect of price changes. All these are more or less unknown at this time and until the manufacturers get back the feel of the mar that will help them to be market-wise they will natura be all over the lot in their estimates.

It must not be assumed, however, that today's esti will in any way hold back the market. All the manu turers may not be equally optimistic, but they will strive to produce and sell as much as they can.

## *Pole Supply for Rural Line Program*

THE ANTICIPATED EXPENDITURES for rural l for the first year after the fall of Germany are the lar in history, but the actual volume of construction ma of very modest size. The big stumbling block is the p shortage and this may be expected to carry over until spring.

Following the initial post-war expenditures, REA the utilities have programs that in the aggregate cal nearly a quarter of a billion dollars for lines per year three years.

One hesitates to state after the war record of Amer industry that anything can't be done, yet one won where the poles are coming from. To build 250,000 m of line between 3,000,000 and 4,000,000 poles wil needed. These poles must be in addition to the nor uses of power companies and telephone companies. E under normal conditions no such pole supply is availa Of course, there are alternate methods, such as steel concrete posts, but whether they will be practical fr the standpoint of installed cost, as well as the operat problems, is still to be determined.

There is also another answer to which some attent might be given and that is a little less impatience finish the job in such a short space of time. Both REA a the utilities are racing to get as much of the unserved t ritory as possible before the other fellow. If some could be found whereby areas could be developed agreement, there might be a more orderly extensio service without the high costs and makeshifts that acc pany pressure work.

## *Mr. Fuller Points The Way*

AT LAST the Fuller brush man has met his equal. F many years this ubiquitous caller has been a symbol of solid merit of intimate home product demonstration. I now over the horizon comes a super Fuller brush man: television announcer. This articulate fashion plate destined to bring product demonstrations to housew on a scale Mr. Fuller and his merry men never reach even in their dreams.

Television is ready for us, that fact seems clear. B are we ready for television; ready to use it as the full selling tool it is? A G. E. spokesman remarked rece that television is nearer ready technically than its p

grams. Nine stations are now operating in Chicago, Los Angeles, New York, Philadelphia and Schenectady, and his guess is that 150 stations will be operating in the larger cities five years after the war.

A few groups have seen the opportunity this new advertising and sales medium offers. One foresighted utility has been presenting experimental television programs, sharpening the new set of techniques they will need to have to bring home-cooking demonstrations right into the living room. Department stores too have spotted a new way to decentralize demonstrations and have requested television permits from FCC.

Television deserves the careful attention of the electrical industry, manufacturers and utilities alike—and today—for it offers an unparalleled opportunity to carry the electrical living story into the American homes on a scale difficult to imagine and in a manner that has been proven. Let's not sell it short. Let's be ready for it.

## Community Relations

A RECENT SURVEY of general business practices indicated that industry's public relations job isn't one thing but is a number of related elements, the first of which is management-employee relations, followed in order by these relationships: customer, community, stockholder. The community relationship, while not altogether new, is a phase of the public relations job on which much more emphasis will be placed in the future, and especially so with electric utilities.

Business generally will be satisfied to have a good name in the community in which it is located, but power companies have a much larger job than merely to build good will. The future of every utility company is bound up entirely with its service area. If it is progressive, has a good health and safety record and generally is a good place to live in, it will attract labor and industry and the utility will benefit proportionately. If the area isn't progressive, other areas will take its industry and labor.

For that reason utility companies are becoming more interested in efforts to make their service areas more attractive to people with families and to industry. Except where power represents a large part of manufacturing cost, rates are not the determining factor in selecting new plant locations. Manufacturers, more than ever before, are trying to get away from the constant strife of an unstable labor area.

While the utility can spearhead local activities to make the home town attractive to new industries and families it cannot do the job alone nor should it want to. Others have an interest also, such as the local newspaper, bank, real estate dealer, tradespeople and the like. With their cooperation and assistance, not only will progress be made, but the appreciation of the part played by the utility will be shared by the community's leaders and then any attack on the utility becomes an attack on the community, because the two are inseparable.

## A Caution on the Use of Bactericidal Lamps

BACTERICIDAL LAMPS should present one of the most interesting post-war load possibilities not so much from the standpoint of its size as of its benefits to the public. If through the proper application of the ultra-violet energy from these lamps a fair degree of control of air and water-born communicable diseases can be achieved, mankind will profit enormously.

However, the energy which is deadly to germs can also be harmful to animals, including humans, unless properly used. The manufacturers of these lamps are well aware of the hazards and have placed cautionary messages with their products, but installers are not always careful to obey the instructions and sellers are not always mindful of their limitations.

A great amount of experimental work has been done and more is in process to determine the effects of this radiant energy upon living organisms, both animal and vegetable, as well as to study types of control equipment. Some of these data have been published but there is still a large amount yet undisclosed which should be made available before too many mistakes are made.

The lamps are not large, 30 watts, but they emit enough energy to be harmful for long exposures at considerable distances, and at smaller distances even very short exposures can produce irritations to the skin (erythema) and eyes (conjunctivitis). At a distance of about 2 ft. from a 30-watt bactericidal lamp only a minute of exposure is required to bring on a perceptible irritation on average untanned skin. A detectable conjunctivitis appears to require a somewhat greater dosage but a two or three minute exposure at the distance necessary to read the caution label on the lamp would produce a sore pair of eyes.

It has been claimed by some that animals' eyes become adapted to this energy and after a while their eyes will no longer be inflamed after exposure to small dosages. Nevertheless, there have been complaints of serious inflammation of chickens' eyes in hen houses where the lamps have been installed. Until there is more convincing evidence borne out by long research, it is best to remember that these rays do produce deleterious effects and a sufficient dosage can kill any living thing.

Aside from the effect of the energy upon living things, there is also the effect of fading. This is a matter, of course, of amount of energy and time and character of material. Nevertheless, it has been found that some specimens have faded as much in a few days under the energy from these lamps as they did in a few months under 100 footcandles of ordinary daylight or artificial light.

In other words, great as are the possibilities for human good from the use of these lamps, there is also the possibility of great harm. That, however, should not cause any great concern provided those who sell and those who use them know what they are doing and take the proper precautions.

# WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

# OWU's Policy on Removal of War-Time Controls

EXPONENTS of the "now-I've-seen-everything" school are having a field day in Washington at the spectacle of some "bureaucrats" fighting other "bureaucrats" and some manufacturers in an attempt to junk war-time controls.

More than a few "bureaucrats" want controls dropped as widely as possible, while their fellows are strenuously opposed to such action, apparently afraid to let go of the tail of the economic tiger they have been riding. More than a few manufacturers are understandably loath to relinquish the devices which assured them of an un-meetable demand and of sufficient materials at stable prices, stable wage rates and fixed selling prices.

### *For Continued Control*

Regardless of what OPA Administrator Chester Bowles says about the desirability of "shelves bursting with goods," his people are urging WPB not to open the floodgates on materials for consumer goods. They argue that failure to control material for these manufacturers would result in a scramble which would send producers into material black markets, boosting the price of consumer goods and leading to inflation. They suggest controlling inflation by a controlled scarcity. Manufacturers of some products, electrical manufacturers among them, oppose an end to scheduling of their output, giving no reason for this position which rings so true as the suspicion that they would rather not return to the rugged ways of competition until there is no alternative.

Director Edward Falck of the Office of War Utilities stands squarely with these "bureaucrats" who want to derrick the controls and get out of business. That is apparent from OWU's speed in amending order U-1 —in record time—to allow what one OWU official says is more construction than will be possible, for materials reasons, in a year. It is further demonstrated by OWU's approval of installation of about 700,000 kw. of steam generating capacity to go into operation in 1947 and 1948, details of which appear elsewhere in this issue of ELECTRICAL WORLD. OWU hopes to add 300,000-kw. of steam and some federal hydro to this program.

Falck recently revised the thinking in the light of which OWU now examines applications for construction of major capital additions. Current thinking would allow the installation of capacity sufficient to bring area operating reserves to 10 percent of area load; would allow a reasonable amount of construction to replace inefficient or obsolete equipment; would allow system rehabilitation which should be performed, including work on transmission and distribution systems and substations which have suffered from deferred maintenance or which increasing load has rendered inadequate. Individual system hardship cases, which for years haven't been worth the WPB-2774 forms they were written on, now are getting sympathetic hearings.

### *Hardship Cases*

Hardship will be considered to exist, and very possibly abated, if existing operations hitherto denied relief require inordinate amounts of capital or boost operating costs to undue levels. A system unable fully to serve its area because of earlier equipment denials or burdensome supply contracts may now get a rehearing, and, if its hardship be real, the necessary equipment. Projects halted earlier in the war stand a better chance than many others, and applications aimed at re-establishing system independence, which hitherto has been subordinated to the war effort, will be considered as hardship cases.

Projects considered essential to the war will get the usual AA-3 ratings from OWU. Hardship projects probably will get AA-3 or AA-5 ratings, depending on individual circumstances. Already some long-term projects have been approved with AA-3 or AA-5 ratings for those items which have long production time, while other items for the same projects, which can be turned out in much less time, have not yet been rated at all, and will not be for some months, after which their position will be re-examined. There is discussion in OWU of the possibility of approving some projects but issuing them no ratings, allowing them to make their own way in the incipient scramble for materials.

### *Third Quarter Position*

Exactly what OWU's position will be following July 1, when the CMP will be "open-ended" to allow any material deliveries which can be made without interference with the war, is not yet clear. Falck hopes that all controls on utility construction will be removed, with ratings confined mainly to essential and real hardship cases. Whether this will materialize remains to be seen.

In seeking unrestricted utility construction after July 1, Falck is on traditionally firm ground. Ever since WPB put together its first reconversion blueprint, however unspecific or premature, a basic concept has been that such industries as rails, utilities, oil and similar undertakings which serve all industry, must rather quickly be put in a position to do so. Then too, generating capacity additions will not start using much material before the fourth quarter, and their heaviest use will not be until next year. If need be, they can be halted as were other similar projects.

The Interior Department and Army Engineers have Congressional mandates in the Hungry Horse authorization, Flood Control and Rivers and Harbors bills to get to work just as soon as possible. When the first unemployment appears, these projects will start. OWU is including substantial federal hydro capacity in the 1947-48 program, based on federal construction policy.

# NEWS OF THE WEEK

## Truman Names Wickard as Administrator of REA

***Former Secretary of Agriculture Appears Likely to Get Confirmed by Senate Without a Major Fight in Committee or On the Floor—Will Not Enter Fight Over Independence of Agency—Shipstead in Opposition***

Senate approval of the nomination of Claude R. Wickard as administrator of the Rural Electrification Administration appeared in prospect at mid-week, and confirmation without a major fight in committee or on the Senate floor appeared just about as probable.

Wickard's appointment was announced by President Harry S. Truman, May 23, at the same time that the President announced his resignation as Secretary of Agriculture, to be replaced by Rep. Clinton Anderson, New Mexico democrat.

An aide to Wickard told ELECTRICAL WORLD that no change was to be expected in Wickard's feeling that REA belongs in the Agriculture Department since it is an agency dealing almost wholly with farmers and one of the more important agencies in business to help farmers. He said Wickard, who had strongly opposed independence both before last year's REA investigating committee and for REA before the Senate Agriculture Committee this year in connection with the nomination of Aubrey Williams for administratorship of REA, had told President Truman recently that he would take no part in the present controversy over independence for REA, and that he would abide by any position Mr. Truman chose to take on the matter.

From his farm in Indiana, Wickard issued the following statement shortly after announcement of his REA nomination:

"I consider it an honor to be nominated as head of REA. The REA cooperatives that bring electricity to rural areas have done a great job in the past and have an even greater job ahead of them. More than half our rural homes are still without electricity.

"Also, I find a deep personal satisfaction in continuing a close association with farm people. Their fine spirit has been a constant inspiration to me in the past, as I know it will be to the new secretary of agriculture."

Chairman Elmer Thomas, of the Senate Agriculture Committee, which will consider the Wickard nomination, told ELECTRICAL WORLD that he was "pleased with both nominations," referring also to that of Anderson. He said he would do all he could to have them reported favorably to the Senate, and indicated that he did not anticipate much delay in doing so. Sen. Thomas said he did not believe the committee would find it necessary to hold public hearings on Wickard unless protests, accompanied by justification which the committee felt it should look into, were made.

Sen. Henrik Shipstead, Minnesota republican, leader of the fight to free REA and a bitter critic of Wickard, said he would be unable to vote for Wickard's confirmation. He indicated that he might not make as determined a fight against Wickard as was made earlier this year against Aubrey Williams, adding that he could "not see why the Senate voted unanimously to make REA independent if it was not to get it away from Wickard." He referred to last week's almost uncontested passage, by the Senate, of the Lucas Bill, giving REA $505,000,000 for three post-war years and re-establishing it as an independent agency through an amendment opposed by sponsor, Sen. Scott Lucas, Illinois democrat, but forced by Shipstead.

Sen. George D. Aiken, Vermont republican and with Shipstead, co-author of a bill to make REA independent, told ELECTRICAL WORLD that he would not fight Wickard's nomination and that he favored it so long as REA is made independent. If the House passes the Lucas bill, Wickard's confirmation would not be expected to encounter much difficulty in the Senate, Aiken predicted. A member of the REA Investigating Committee last year, Aiken said the soundness of Wickard's position on REA was shown by the fact that he turned down the plan to borrow money from cooperatives to finance insurance companies.

### Lilienthal Confirmed

Nomination of David Lilienthal as member of the board of directors of the Tennessee Valley Authority for a nine-year term ending in 1954, was approved overwhelmingly by the Senate this week with the record showing dissent of only two members, Sens. Kenneth McKellar and Tom Stewart, Tennessee Democrats, whose principal charge against Lilienthal was that of political activity against them.

Confirmation came on a voice vote, after which McKellar and Stewart asked that the record show their dissenting votes.

### SPA Borrows S. Moment

Samuel Moment, of the Bonneville Power Administration, has been loaned to the Surplus Property Administration to study and report on economic and marketing problems relating to more than 50 government-owned aluminum plants.

Moment has prepared such studies for BPA, one of which was the basis of BPA's testimony given at the recent investigation of the Shipshaw contract conducted by the Senate Small Business Committee.

# Brownout Study Indicates Annual Effect of Measure

***Load Research Committee of the Association of Edison Illuminating Companies Projects Figures from 3 Months and 8 Days of Brownout to Show Annual Reduction in Output, Energy Sales, and Gross Revenues***

Effects of three months and eight days of the brownout, projected to an annual basis, were reductions of 2,033,900,000-kw.-hr. in annual system energy output, 1,752,400,000-kw.-hr. in annual system energy sales, 872,600-kw. in maximum sum of non-coincident peaks and $48,078,000 in gross revenues.

Annual fuel savings were 1,326,600 tons of coal, 401,400 barrels of oil and 1,138,400 mcf of natural gas.

These figures were contained in a report on the brownout recently submitted by the Load Research Committee of the Association of Edison Illuminating Companies. Constantine Bary, of the Philadelphia Electric Co., and a consultant to the Office of War Utilities, is chairman of the committee which was asked to make the report by Director V. M. Marquis of the Office of War Utilities' Power Division.

The report was compiled by sampling data from member systems of the A.E.I.C. as well as a few non-member systems, with results projected to include all electric power systems not exempted from observance of order U-9, the brownout order.

The sampling represented direct data on almost 60 percent of the total number of commercial customers, and annual energy sales to these customers, which were served by non-exempt portions of the industry. Data on individual companies were compiled by the committee member responsible for the given area. All individual system reports then were compiled and projected to an annual basis.

In transmitting the report, Chairman Bary said ". . . the results contained in this study must be viewed as estimates resulting from an analysis of such data as were available and from consideration of local conditions of service rendered, territory served and operating practices."

Reductions in peak loads varied from 301,900-kw. on the morning peak, (sum of all non-coincident morning peaks) to 754,300-kw. on the evening peak, with the maximum peak reduction attributable to the brownout 872,600-kw.

Load curves for six representative systems for an average weekday in February, showed that about 10 percent of the energy saved by the brownout in February was saved between midnight and 8 a. m.; about 15 percent from 8 a. m. until noon; about 30 percent from noon until 5 p. m.; about 35 percent from 5 p. m. until 10 p. m., and about 10 percent from 10 p. m. until midnight.

Maximum brownout savings were realized at about 7 p. m. on the average, the biggest brownout savings in the forenoon were about 40 percent of the saving possible at 7 p. m.

"The general uniformity of the shape of the restricted load for each of the groups of systems is worthy of note," the committee report declared with respect to the load curves for the six representative systems.

The study did not indicate what savings could have been made in systems exempted from compliance with U-9.

"The volume of energy sales to the commercial class by utility systems not exempt from the order, and covered by our estimates, represents 80 percent of the total energy sales to this class of consumers by the entire electric industry in the United States," the report declared.

In projecting the data to an annual basis, the committee assumed that year-round compliance with U-9 would have been as good as that which obtained during the actual life of the order. This was estimated at between 95 and 99 percent. The survey did not reflect what effects the orders might have had on energy and load requirements of commercial and industrial establishments which generate their own electricity.

Where no sample data were available for non-exempt portions of the industry, the committee developed its own estimates of the brownout's effects from

**Estimated Effect of Order U-9 on Load, Energy and Fuel Requirements and Gross Revenues of Utility Systems in United States**

| Area | Reductions in load, energy and fuel requirements and gross revenues | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Annual Energy kwh X 1000 | | System non-coincidental loads — kw. | | | Coal tons | Oil bbls. | Gas mcf. | Gross Revenues $ |
| | Sales | Output | A.M. | P.M. | Maximum | | | | |
| New England | 99,200 | 119,200 | 16,300 | 62,300 | 62,300 | 78,400 | ..... | ..... | 3,081,000 |
| New York State and City | 236,000 | 270,000 | 30,000 | 93,700 | 135,200 | 174,200 | ..... | ..... | 8,127,000 |
| Eastern Pa.; N. J.; Del.; Md.; and D. C. | 280,000 | 322,000 | 51,100 | 108,700 | 127,000 | 209,000 | 163,000 | ..... | 6,372,000 |
| Western Pa.; W. Va.; Ohio; Western Va.; Ky. (except Western Ky.); Ind.; Mich. | 391,400 | 442,600 | 90,800 | 200,300 | 201,300 | 270,200 | ..... | ..... | 8,625,000 |
| Va. (except Western Va.); N. C.; S. C.; Ga.; Fla.; Ala.; Tenn.; & Eastern Miss. | 231,100 | 277,300 | 28,500 | 81,000 | 85,200 | 191,300 | 166,400 | ..... | 5,869,000 |
| Minn.; Wis.; Iowa; Ill.; Western Ky.; Eastern Mo. | 371,800 | 400,200 | 58,200 | 155,900 | 196,500 | 305,200 | 6,000 | 101,700 | 12,238,000 |
| N. Dak.; S. Dak.; Wyo.; Nebr.; Colo.; Kan.; and Western Mo. | 100,800 | 115,400 | 19,700 | 36,300 | 42,900 | 89,800 | 18,400 | 659,700 | 2,791,000 |
| N. Mex.; Tex.; Okla.; Ark.; La.; and Western Miss. (largely exempt) | 33,400 | 37,100 | 5,800 | 12,300 | 17,800 | 8,500 | 16,900 | 377,000 | 844,000 |
| Wash.; Mont.; Ore.; Idaho; and Utah (fully exempt) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Calif.; Nev.; Ariz. (almost fully exempt) | 8,700 | 10,100 | 1,500 | 3,800 | 4,400 | ..... | 30,700 | ..... | 140,000 |
| Total, U. S. | 1,752,400 | 2,033,900 | 301,900 | 754,300 | 872,600 | 1,326,600 | 401,400 | 1,138,400 | 48,078,000 |

other data which approximated the conditions in areas for which no sample data were available, and from consideration of average values of all sampled areas.

Preparation of the report was rendered difficult, the committee said, because its effects were small in comparison to the total load and energy supplied, averaging about one percent of total system output, and because of the short period of time between the start of the brownout and the due date of the report.

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## OCR Finds Soaring Call for Household Appliances

Demand for household appliances has soared past that of any year prior to the war, the Office of Civilian Requirements reported this week on the basis of preliminary tabulations of its fourth nation-wide consumer requirements survey.

OCR emphasized that demands reported in its preliminary tabulation are current demands and do not represent post-war demand. The survey, conducted before V-E Day, shows only demands from households and does not include needs of apartments or new housing.

OCR reported that 5,852,000 persons would purchase mechanical refrigerators now if they were available, an increase of 2,000,000 over the number of purchasers on April 1, 1944. Potential purchasers of vacuum cleaners total 3,501,000, an increase of more than 2,000,000, and potential purchasers of washing machines total 5,835,000, an increase of more than 1,500,000.

This accumulation of demand between April 1, 1944 and April 1, 1945, was one of the most striking features of the survey, OCR said. Accumulative demands for mechanical refrigerators, vacuum cleaners, radios, electric irons and washing machines shows increases of 25 to 100 percent over the demand for these items reported in a similar OCR survey a year ago. In units these percentages represent increases ranging from a million to 2,500,000.

Later reports will show the percentages of persons who on questioning expressed reservations as to their intentions of purchasing.

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## Will Take Over Utility

Holston River Power Co. now serving the town of Abingdon, Va., will soon become a part of the Appalachian Electric Power system, according to an announcement made by M. C. Funk, vice-president and general manager of Appalachian.

# Load Data Large Factor in Post-War Engineering

***Solution of Post-War Energy Supply Problems Will Require More Data on Performance of Old and New Kinds of Utilization Equipment Than Is Now Available—E.E.I. Committees Meet at Cincinnati***

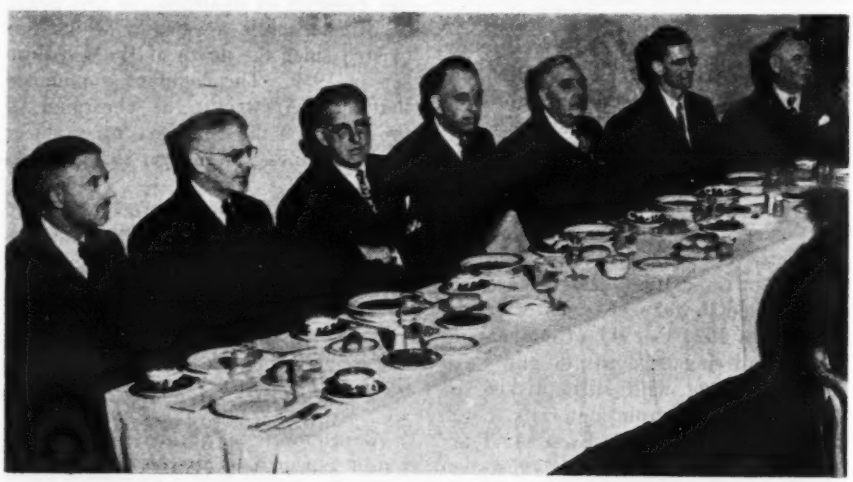
Greater concern than in the past with the characteristics and performance of utilization equipment on customers' premises will be included in the thinking of the power company engineer as he comes to grips with post-war problems; this conclusion sums up impressions from the meeting of the Transmission and Distribution Committee, E. E. I., at Cincinnati, May 15. This meeting and one of the Electrical Equipment Committee, held May 18 in the same city, were small in size because of ODT restrictions, but both made up for that limitation by the value and interest of their discussions.

Particular support for the conclusion stated above comes from the remarks of Frank Sanford, retiring T and D chairman, as he laid down the gavel after two years of direction of the committee's work. Mr. Sanford recommended that the committee include in its program more studies and investigations of performances of customers' equipments in order to build up a body of data adequate for solution of the distribution problems plainly foreseen in the post-war period.

In this period, he said, system expansions will be more difficult to finance, there will be fewer very large industrial customers and power uses in the home will increase. This means that distribution budgets will be proportionately larger in the totals of utility expenditures and therefore must be substantiated with the best and most comprehensive data obtainable.

Along this line were the paper on cyclic fluctuations of fluorescent lamps by W. R. Weise, Cincinnati Gas & Electric Co., and the progress report of John W. Anderson, Philadelphia Electric Co., on studies to be made jointly with the Air Conditioning and Refrigerating Machinery Association on home food freezers and room coolers. These appliances, contemplated to be sold as "package" units to be plugged into convenience outlets, apparently will have motors with starting currents that may be quite troublesome. The kind of trouble was indicated in Mr. Weise's paper—irritating flicker of fluorescent tubes caused by voltage dips that would have no apparent effect on the light from incandescent lamps.

Measures of emergency service restoration to avoid long outages affecting large numbers of customers, as from floods, hurricanes and the like, were



**WAR PROBLEMS REVIEWED—New England System Operators' annual meeting program included presentations by K. M. Irwin, Philadelphia Electric Co., on war damage to and reconstruction of generating plants in northwest Europe; R. G. Lockett, I-T-E Circuit Breaker Co., on isolated phase construction; and W. G. Denhard, Allis-Chalmers Manufacturing Co., on gas turbine development. Left to right, head table: D. P. Reed New England Power; Mr. Lockett; Mr. Irwin; A. T. Haendler, Boston Edison Co., retiring chairman; E. W. Cole, New Bedford Gas & Edison Light Co., chairman; Mr. Denhard; and J. W. Lingary, Lynn Gas & Electric Co., secretary**

discussed as a proposed subject for committee study, L. R. Gaty, Philadelphia Electric, presiding. Consensus was that customers will be more critical of service quality post-war than now, that intelligent action should be taken to head off misguided legislation such as bills recently entered in Rhode Island and Wisconsin to require all lines to be placed underground, and that the economic choice must be quick restoration as against 100 percent service continuity.

Summary of 31 replies to a committee questionnaire on lightning performance of wood pole lines below 66-kv., presented by C. D. Brown, Wisconsin Electric Power Co., was chiefly valuable as showing the improved performance that can be obtained by modernizing lines. Suggestion of the term "kv.-inches" as a measure of transmission line insulation was made by H. N. Elkvall, Philadelphia Electric, in a paper relating the experience of that company with 13 and 33 kv. lines. A paper by J. A. Rawls, Virginia Electric & Power Co., presented evidence favoring wood pole over steel tower construction on the basis of fewer lightning interruptions for the former.

***Symposium on Substation Design***

Outstanding feature of the meeting of the Electrical Equipment Committee was a symposium on distribution substation design which included papers by R. T. Henry, Buffalo General Electric Co., L. Birckhead, Consolidated of Baltimore, Frank Poague, Ebasco Services, E. B. Shew, Philadelphia Electric, and E. H. Snyder, Public Service Electric & Gas Co. These papers and the discussions of them amounted to a critical review of the history of substation development. The trend, well-established, is towards more and smaller substations, making fullest use of automatic equipment, principal among which is the reclosing breaker, and exhibiting three definite movements towards simplification, standardization and prefabrication.

Indicative of what has been accomplished in substation design were figures quoted in general terms of reductions from 1926 to 1941 of copper and steel requirements down to one third for equal duty with still further decreases resulting from materials scarcities in the war period. Even so, it can not be said that in general substation costs have been lowered; all that has been accomplished is to keep them on a level.

"There is need that failures of equipment, all kinds of failures, should be recorded in sufficient detail and studied by engineers and operating men," said F. W. Smith, Virginia Electric & Power, in a paper relating several cases of substation troubles. The session closed with presentations of highlights of recent progress and future trends by manufacturers' representatives, S. H. Mortensen for Allis-Chalmers Manufacturing Co., D. M. Jones for General Electric Co., and J. K. Hodnette for Westinghouse Electric Corp.

## Paper Is Ammunition

Paper is scarce today because over 700,000 different war items are wrapped, labeled or made from paper or container board. The war in the Pacific increases the demand because products going to that area require double and triple packing for protection against weather and insects.

So share your ELECTRICAL WORLD; the number of copies is limited.

Keep in operation in your office and plant a continuous drive to collect all waste paper for salvage. Contribute your dead correspondence, obsolete records, useless display material, and unusable cartons.

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## Georgia Power Names New Chairman and President

Preston S. Arkwright, president of the Georgia Power Co., was elected chairman of the board of directors, and William E. Mitchell, vice-president and general manager, was elected president of the company at a meeting of the board held last week in Atlanta.

The elevation of Mr. Arkwright to the position of chairman of the board of directors fills a vacancy which has existed since the death of H. M. Atkinson in 1939. The company announced that Mr. Arkwright, as chairman of the board, is the chief executive officer of the business, in general charge of its operations.

Mr. Mitchell, the new president, is in Europe on an assignment from the Secretary of War. He will return in about three months.

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## Nebraska Public Power Workers Denied Rights

A proposal to grant employees of public power districts the same general collective bargaining rights they had under private power ownership has been killed by the Labor Committee of the Nebraska Legislature. A move to revive the bill made by Senator Sidney J. Cullingham, vice-president of Nebraska Power Co., was defeated.

Organized labor has been denied the right to bargain collectively with Consumers Public Power District on the ground that a subdivision of the state cannot enter into labor agreements unless authorized to do so by the legislature.

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## Lake Charles Items Not Usable by Dutch

Termination of negotiations between the Netherlands Government Purchasing Mission in the United States and the Defense Plant Corporation for acquisition of three steam turbines owned by DPC in its Lake Charles, La., magnesium plant was due to expanded Dutch requirements for electrical equipment and not to price differences on the machines, Dutch officials told DPC.

It had been reported that the Dutch were dissatisfied with the price (ELECTRICAL WORLD, May 12, Page 116), but DPC officials told ELECTRICAL WORLD that they had not reached the point of discussing prices for the three 7,500 kw. turbines with the Dutch before negotiations were halted.

Dutch spokesmen explained that it had been anticipated that the Netherlands would be freed in its entirety at one time. When the piecemeal liberation began last year, it became apparent that estimates of requirements of electrical equipment for draining flooded areas would have to be revised. Accordingly, DPC was informed, the Netherlands Government is studying the procurement of new equipment in greater quantity than would have been available at Lake Charles. The mission thanked DPC for its cooperation in the negotiations.

Meanwhile, negotiations for transfer of a 35,000-kw. unit from the Lake Charles plant to Lake Catherine, Ark., where its output will be marketed by the Southwestern Power Administration, have been completed, and work on dismantling the machine for shipment is being undertaken under the direction of Sanderson & Porter. The Office of War Utilities had recommended transfer of the unit to Lake Catherine, but actual work on the move was held up for some weeks while Louisiana officials attempted to keep the unit at Lake Charles.

Title to the unit will remain in Defense Plant Corporation hands for sometime, DPC officials said.

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## Reduces Preferred Shares

Electric Bond & Share Co. has reduced the number of shares of its preferred no par value stock from 3,101,395 to 3,094,095 shares.

# Ways of Bettering Control Cable Performance Given

***Electrical Equipment Committee of Pennsylvania Electric Association Learns 8 Measures to Reduce Control Cable Trouble—Joint Committee Will Study Basic Improvement in Reliability of Distribution***

Bettered performance from control cables, progress toward longer-lived tubes for carrier relaying, and prevention of condensation in mechanism enclosures were dominant themes for technical discussion at the May 17 and 18 meeting of the Pennsylvania Electric Association electrical equipment committee in Reading. Another topic opened up was the fortification of distribution for improved fault clearing, loadability and reliability.

Basic improvement in the reliability of distribution is envisaged in a joint committee study of five provinces, (1) load resumption after circuit outage, (2) circuit loading vs. rating, (3) distribution relaying, (4) feeder-end protection, (5) reclosing breakers vs. circuit breakers for small substations. R. L. Salsbury, Duquesne Light Co., outlined the intended coverage under each item.

### *D. S. Roush Made Survey*

Increasing trouble with control cable had led to an assigned survey by D. S. Roush, Pennsylvania Edison Co. He reported wide variation in frequency of insulation tests, one megohm predominating as the criterion. Corrosion, mechanical or thermal injury, poor splicing, freezing of trapped water in conduits, floodwater, suspension-ring cuts, corrosion of pipes in cinder fills were cited as ruling causes.

Corrective measures suggested were in part: (1) better installation, (2) better grounding and drainage, (3) seals, (4) ventilation, (5) general improvement in workmanship and inspection, (6) avoidance of sharp bends, (7) less congestion in ducts, (8) use of Kerite or similar cable buried in the ground in lieu of lead-sheath cable. J. S. Brown, Duquesne Light, mentioned specification and use (1,000,000 feet now) of cable with oil-base compound and Neoprene jacket. B. E. Hagy said Philadelphia Electric Co. is replacing control cable on a sizable program that averts use of the leaded type.

Collaboration of utilities in the matter of reporting experience with carrier tubes and in returning for study such tubes as have had short life was sought by J. Sodowsky of RCA. He told of the factory-testing and laboratory-control procedures, decried the use by utilities of servicemen's comparatively crude tube-test sets for such purpose and explained why some of the tubes commonly used for carrier could hardly be expected to survive 8,000 or 10,000 hours of full or over-rated duty. He promised cooperation in providing tubes to meet carrier requirements fully.

Another joint report by L. J. Gill, Pennsylvania Power & Light Co., treated the matter of moisture condensation in C. T. and junction boxes as well as mechanism housings. He favored use of moderate amounts of supplementary heat and small amounts of ventilation as a remedial approach; seals for conduit and pipe entrances are helpful and cork gaskets are preferred over felt. Discussion elicited wide variation in the amounts of heat and ventilation practiced by member companies.

Inspiring his listeners to spread their vision more broadly over the problems of the nation as well as of the utilities, A. J. Althouse, assistant to the president, Metropolitan Edison Co., in a luncheon talk emphasized also the deferred maintenance and replacement-design tasks immediately ahead. Improvement in design and manufacture of apparatus are becoming less a factor than system design and coordination. He cited the 1.25 percent of accidents in 1944 among a group of companies with 12,000 employees attributable to faulty equipment design and manufacture as evidence and added that 6.6 percent can be blamed on improper installation, maintenance or use and 4.3 percent to equipment being left hazardous at the end of repairs. In short, design should, he said, take more cognizance of the hazard aspect; technology needs to be fortified by vision, clear thinking, wise convictions and sound decisions in all these matters if electricity is to contribute its share to human betterment.

All Friday was devoted to presentations of apparatus developments by manufacturers. For General Electric Co., S. B. Farnham and C. A. Woodrow exhibited the trends in factory-assembled substation components, and A. E. Anderson in switchgear. For Westinghouse Electric Corp., E. D. Harder portrayed electronic advances, and A. W. Hill the trends in pneumatic mechanisms for oil circuit breakers; the latter emphasized the marked reduction in closing-coil current and the faster speed of air; more than two-thirds the new outdoor high voltage breakers are being pneumatically operated. Farnham disclosed savings up to 42 percent through adoption of factory-assembled substations, adding that duplex units are the cheapest, in general, regardless of number of feeders.

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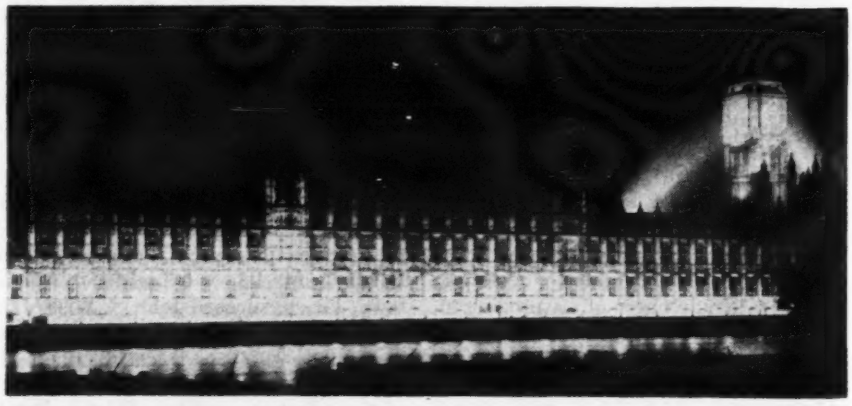
## Four Electric Equipment Orders Revoked by WPB

WPB has revoked four orders governing production of electrical equipment and removed rating floors established by the orders.

The revoked orders are:

L-250, covering electric motor controllers; L-221, covering electric motors and generators; L-273, covering bus ways; and L-315, covering enclosed safety switches, enclosed branch and service circuit breakers, service entrance equipment panel and distribution boards and knife switches.



**FLOODLIGHTING IN ENGLAND—The Houses of Parliament with Big Ben on the right during the V-E Day celebration**

## ALCOA Head Denies Link with Shipshaw

### *Vice-President Wilson Replies to Charges Made against Firm by Interior Secretary Ickes*

I. W. Wilson, vice-president of the Aluminum Co. of America, wrote Sen. James E. Murray, Montana Democrat and chairman of the Senate Committee on Small Business, last week "to set the record straight" with respect to "several glaring misstatements" which he said were made by Interior Secretary Harold L. Ickes who testified last week before the committee on the Shipshaw power and aluminum plant on Quebec's Saguenay River, financed in part by the United States.

Wilson cited the committee's record of the Shipshaw development and opinions of the United States District Court, and Second Circuit Court of Appeals, the latter of which ruled finally recently on the government's anti-trust case against ALCOA, to correct Ickes' statements.

He said the committee record showed that arrangements which Ickes described as between ALCOA and the government actually were made between Metals Reserve Corp., a RFC subsidiary, and the Aluminum Co. of Canada. In reply to an Ickes statement that the two companies have "the same officers and the same board of directors," Wilson cited a section of the District Court decision which said:

#### *2 Firms Are Independent*

"At no time since the first organization meetings of the various subsidiaries of Aluminum, Ltd.. . . . has any director or officer or employe of Aluminum Co. of America been also a director or officer or employe of any of the subsidiaries of Aluminum, Ltd."

The lower court finding, Wilson added, has been affirmed by the upper court. Aluminum Co. of Canada is a wholly owned subsidiary of Aluminum, Ltd.

Wilson declared that Ickes' statement that Shipshaw power is generated for ALCOA "is absolutely without foundation in fact."

In reply to an Ickes statement that ALCOA preferred to make aluminum in Canada rather than in the United States because "ALCOA has never cared much for the United States of America, except as a purchaser of its product at its monopolistic prices, and by building in Quebec, ALCOA would be less troubled by labor." Wilson insisted that ALCOA did not build Shipshaw, and that thus, "this whole statement is utterly unfounded." He added that between 1939 and 1944, ALCOA spent more than $300,000,000 of its own funds to expand aluminum facilities.

Wilson said ALCOA is "tremendously interested" in expansion of aluminum in the Northwest and will do all it reasonably can to that end. He said there is no justification for charging ALCOA with acts which it did not perform and which are against its own interest, adding:

"If the fears regarding the Shipshaw project prove correct, if cheap aluminum is made there and dumped in the United States, ALCOA will be the chief sufferer."

ALCOA, as largest user of Bonneville power, expects to continue to cooperate with Bonneville Power Administration, and would appreciate cooperation in return, Wilson declared.

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## Storing Soft Coal Now Is Low-Cost Insurance, Krug

WPB Chairman J. A. Krug urged users of bituminous coal to stock as much as possible this summer and warned that "the prospect of a coal shortage is such that the cost of storing coal should be looked upon as low-cost insurance for an adequate supply of coal for a given industry."

The production deficit which is impending, Krug warned, "will be greater than in any previous coal year of the war. This deficit, according to the Solid Fuels Administration for War, will be at least 25,000,000 tons and perhaps much greater."

Krug's statement came in a letter to 25,000 members of coal consuming industries. He laid the anticipated deficit to "losses sustained in 1945 to date and manpower conditions." Krug warned that withholding of orders now and failure to use lower grade strip and deep-mine bituminous coals will curtail production and worsen the shortage next winter.

"As matters stand now," he concluded, "no industrial consumer next winter can be guaranteed a full supply of coal from current production."

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## Heads Allentown Utilities

C. E. Oakes, president of the Birmingham Electric Co., Birmingham, Ala., was elected this week president of the Pennsylvania Power & Light Co., Allentown, Pa., to succeed John S. Wise, Jr., retired. A. D. Root, for many years connected with the Electric Bond & Share Co., was elected a vice-president of the Allentown utility. Electric Bond & Share is parent of both these properties.

## Amended PR13 Favors Government Units

WPB has amended Priorities Regulation 13, governing special sales, to provide for the preferences in the purchase of surplus property accorded to federal, state and local governments under the Surplus Property Act of 1944.

Pointing out that governmental agencies must comply with all applicable WPB orders and regulations in the purchase of surplus property, WPB issued Direction 3 which modifies the requirements of PR 13 as follows:

1. During the first 30 days following notice of availability of surplus property, preference will be given to federal agencies and state and local governments ahead of other purchasers who place orders bearing ratings equal to ratings assigned governmental applications.

2. During the 30 day period following notice of availability, filling of orders will be postponed and the sequence in which a disposal agency received orders bearing the same rating during this 30-day period may be disregarded.

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## WLB Orders Westinghouse to Extend Pay Increase

The War Labor Board directed the Westinghouse Electric Corp. to extend its practice of granting automatic 10 percent salary increases after six months' service to employees in salary ranges with a minimum of $250 or less per month to salaried employees in higher salary ranges.

The extension, opposed by industry members of the Board, was requested by the United Electrical, Radio and Machine Workers, CIO, and involves about 6,000 salaried employees of 12 Westinghouse plants.

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## Street Railway Would Buy Arkansas Missouri Utility

Hot Springs Street Railway Co., which is owned by Gus B. Walton, Little Rock, Ark., investment banker, has applied to Arkansas Public Service Commission for authority to purchase 71,809 shares of common stock of Arkansas Missouri Power Corp. for $925,000.

This purchase would give Walton effective control of the utility since it represents 43 percent of the outstanding common stock, with the rest widely scattered. Arkansas Missouri serves 43 towns in Arkansas and Missouri.

## Canadian Central Stations Report March Increase

An increase, but all in secondary power, in output was reported in March by central electric stations in Canada through the Dominion Bureau of Statistics. The output for the month was 3,-[illegible]515,000 kw.-hr. as compared with 3,124,235,000 kw.-hr. the preceding month, and 3,516,052,000 kw.-hr. in the corresponding month of 1944.

The advance was all in secondary power which increased from 245,954,-000 to 640,063,000 kw.-hr.

Consumption of primary power for the first quarter of 1945 was 8,159,478,-000 kw.-hr. as compared with 9,306,-127,000 kw.-hr. in the corresponding quarter of 1944. Exports to the United States also dropped from 589,630,000 kw.-hr. for the first quarter, 1944, to 573,587,000 kw.-hr. in 1945.

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## Average Daily Output Drops 2.5% in March

Electric energy produced for public use in March 1945 totaled 19,526,557,-000 kw.-hr., a decrease of 0.1 percent when compared with March 1944, while combined production of utilities and industrial establishments of the country, including generation by railway and railroad power plants, was 23,921,984,-000 kw.-hr. during the same period, a decrease of 0.3 percent from March of last year, according to a report issued by the Federal Power Commission. Average daily production of electric energy for public use in March was 673,330,000 kw.-hr., a decrease of 2.5 percent when compared with the previous month.

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## Public Service of Indiana Buys 2 Utility Companies

Public Service Co. of Indiana has acquired two business-managed utilities in the southeastern part of the state. The Versailles Light System which has been getting power from the Public Service substation at Osgood was bought for $35,000. No purchase price for the Oldenburg Electric Light & Power Co. was revealed. Both purchases are subject to the approval of the Public Service Commission.

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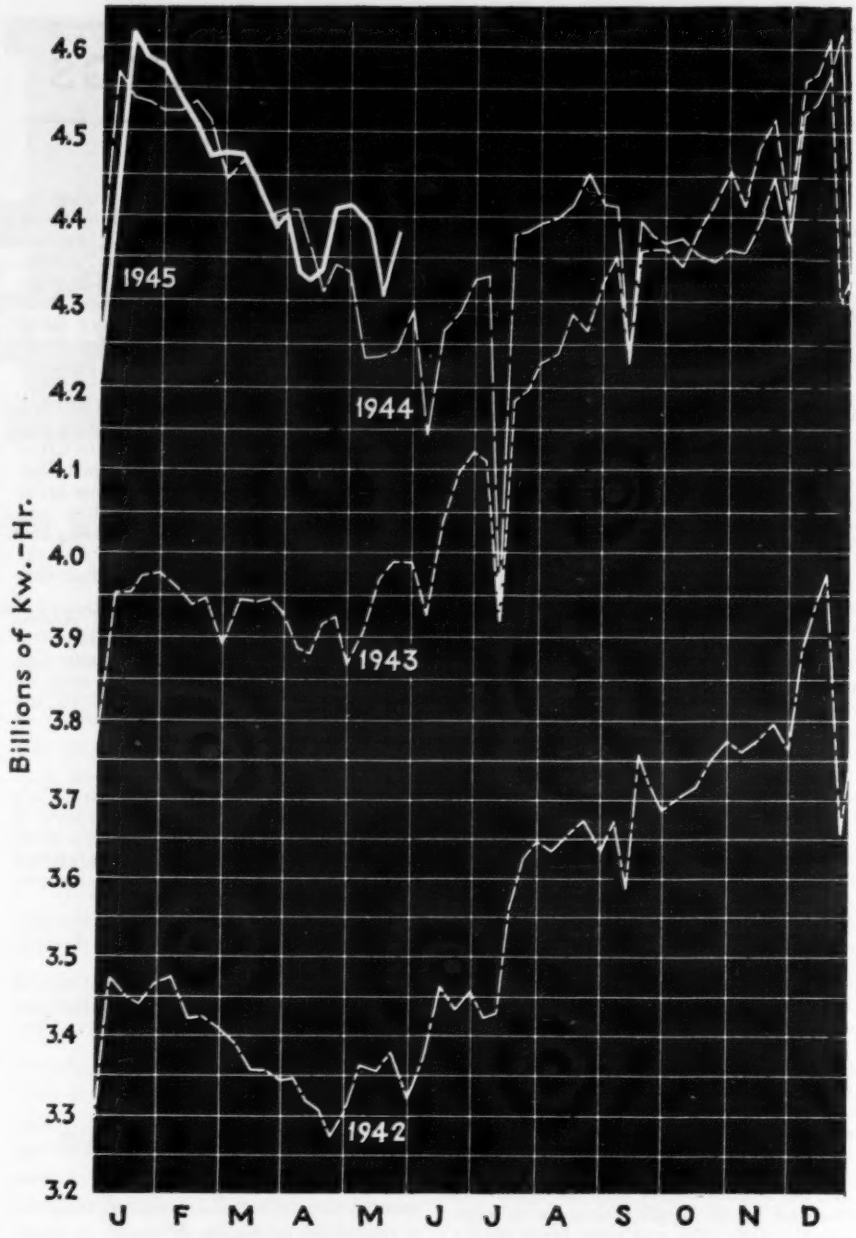
## Louisburg, N. C., Shuts Plant

Louisburg, N. C., closed its municipal light plant on May 2 to buy power wholesale from the Carolina Power & Light Co.




## Electric Output Curve Moves Upward

The electric output curve moved upward during the week ended May 19, 1945, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry totaled 4,377,221,000 kw.-hr., compared with 4,302,381,000 kw.-hr. during the preceding week. During the week ended May 20, 1944, the amount of electrical energy distributed amounted to 4,245,678,000 kw.-hr., this year's figure representing an increase of 3.1 percent.

All of the major geographic regions of the country reported increases as compared with last year, with the exception of the Mid-Atlantic states. Though this group remained in the minus column with a decrease of 1.3 percent, it cut the loss from 3.0 percent reported for the week ended May 12.

**Weekly Output Millions Kw.-Hr.**

| 1945 | | 1944 | | 1943 | |
|---|---|---|---|---|---|
| May 19 | 4,377 | May 20 | 4,246 | May 22 | 3,992 |
| May 12 | 4,302 | May 13 | 4,238 | May 15 | 3,969 |
| May 5 | 4,397 | May 6 | 4,234 | May 8 | 3,904 |
| Apr. 28 | 4,416 | Apr. 29 | 4,336 | May 1 | 3,867 |
| Apr. 21 | 4,411 | Apr. 22 | 4,344 | Apr. 24 | 3,925 |
| Apr. 14 | 4,332 | Apr. 15 | 4,307 | Apr. 17 | 3,917 |
| Apr. 7 | 4,322 | Apr. 8 | 4,361 | Apr. 10 | 3,882 |
| Mar. 31 | 4,329 | Apr. 1 | 4,409 | Apr. 3 | 3,890 |
| Mar. 24 | 4,402 | Mar. 25 | 4,409 | Mar. 27 | 3,928 |
| Mar. 17 | 4,398 | Mar. 18 | 4,400 | Mar. 20 | 3,947 |
| Mar. 10 | 4,446 | Mar. 11 | 4,426 | Mar. 13 | 3,945 |
| Mar. 3 | 4,472 | Mar. 4 | 4,465 | Mar. 6 | 3,947 |

**Percent Change from Previous Year**

| | Week Ending | | |
|---|---|---|---|
| | May 19 | May 12 | May 5 |
| New England | + 3.8 | — 0.5 | + 4.1 |
| Mid Atlantic | — 1.3 | — 3.0 | + 1.6 |
| Central Industrial | + 4.7 | + 1.9 | + 5.1 |
| West Central | + 6.8 | + 7.9 | + 8.5 |
| Southern States | + 8.2 | + 8.9 | + 8.4 |
| Rocky Mountain | + 6.1 | + 6.0 | + 5.6 |
| Pacific Coast | + 0.3 | + 2.0 | + 0.4 |
| Total United States | + 3.1 | + 1.5 | + 3.9 |

# SEC DECISIONS—HEARINGS

The Securities and Exchange Commission in a series of orders recently issued affecting electric utility companies:

GRANTED to the North West Utilities Co. and its parent, the Middle West Corp., an additional six months within which to comply with an order issued by the commission on September 10, 1943, calling for the "prompt liquidation" of the subsidiary. The six-month extension will be from March 10, when a previous six-month extension ended. It was granted, the commission added, because the record showed that the applicants "have been unable in the exercise of due diligence to comply with the order." North West has divested itself of its interest in the common stock of the Lake Superior District Power Co., a subsidiary, and the applicants stated that negotiations are under way now with three persons and firms interested in acquiring the Northwestern Public Service Co., another subsidiary of North West. Under present plans, North West would invest the proceeds from the sale of Lake Superior and Northwestern in additional common stock of its other subsidiary, the Wisconsin Power & Light Co., to reduce the outstanding preferred stocks of Wisconsin and through a refunding program, to reduce the dividend rates on the stocks from 7 and 6 percent to not more than 5 percent and to distribute the common stock of Wisconsin to stockholders of North West upon its dissolution and liquidation.

DENIED REQUEST of the Associated Gas & Electric Co., Associated Gas & Electric Corp. and Gas and Electric Associates for a stay of all proceedings on a pending plan for recapitalization of the New England Gas & Electric Association. The three companies, which have claims totaling $30,000,000 against New England, sought to have the recapitalization proceedings postponed until the issues regarding the validity, extent and rank of their claims had been determined. In denying the motion, the commissioners said the arguments advanced by the applicants seem to overstate the difficulties and risks faced by the claimants if the hearing proceeds as ordered beginning May 22. The commission admitted the issues regarding the claims "will have to be determined before we can finally pass upon the plan," but added that "since this is a time-consuming process and since we are not yet prepared to announce any conclusions with respect to the claims, it seems to us that the most orderly course is to proceed to hearing on such other aspects of the case."

HAS APPROVED proposals outlined in a joint application-declaration filed by Milwaukee Electric Railway & Transport Co. and its parent, Wisconsin Electric Power Co. The approved proposals involve the following transactions: Milwaukee will redeem at par plus accrued interest $400,000 of its first mortgage 4 percent bonds owned by Wisconsin; will purchase for cash at par for retirement 10,000 shares of its $100 par value capital stock from Wisconsin, and will surrender the bonds and the stock on the basis described.

HAS SHORTENED from ten to five days the time in which competitive bids may be invited for $26,600,000 of first mortgage bonds to be issued by the Texas Power & Light Co., Dallas, Tex. The bonds are part of a $31,500,000 issue approved by SEC. The remaining $4,900,000 is to be exchanged for a like amount of 3¾ percent bonds due in 1965, held by Texas' parent, the American Power & Light Co. The commission also approved Texas' plan to issue $2,500,000 of 2 percent promissory notes to the First National Bank, the Mercantile National Bank and the Republic National Bank, all of Dallas. It reserved jurisdiction over the results of competitive bidding and legal fees incurred in the refinancing.

GRANTED EXTENSION of one year to Cities Service Co. and its subsidiaries until May 5, 1946 to comply with an integration order issued May 5, 1944. Cities Services had elected to dispose of its utility interests and retain interest in companies engaged in the oil, wholesale natural gas and other non-utility businesses.

APPROVED APPLICATION of North American Co. to sell at competitive bidding 700,000 shares of common stock of Pacific Gas & Electric Co. The commission also reduced the 10-day minimum period for the reception of bids to six days.

### *Hearings Scheduled*

JUNE 1: On Long Island Lighting Co.'s proposal to issue certificates of deposit in exchange for the outstanding shares of its Series A 7 percent cumulative preferred stock, Series B 6 percent cumulative preferred stock and common stock.

JUNE 5: Adjourned hearings on the plan for integration of Columbia Gas & Electric Corp.

JUNE 5: On whether the General Gas & Electric Corp. may receive 3,461 shares of new common stock in its subsidiary, Tidewater Power Co.

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## Salem to Vote on Co-op

Voters of Salem, Ore., who a few months ago rejected a proposal to grant a franchise to Salem Electric, a cooperative utility, will vote on the question again June 22. The proposal calls for a franchise to operate in 30 downtown business blocks.

## UTILITY REPORTS

| | Net Income 1944 | 1945 |
|---|---|---|
| *Arkansas Power & Light | $2,459,930 | $1,182,859 |
| *California Electric Power and subs. | 1,256,539 | 1,295,135 |
| *Carolina Power & Light | 2,378,888 | 2,511,829 |
| *Columbia Gas & Electric and subs. | 13,553,423 | 13,207,581 |
| †Detroit Edison and subs. | 6,407,477 | 8,623,995 |
| *Kansas City Power & Light | 3,010,717 | 3,019,468 |
| *Mississippi Power & Light | 1,470,193 | 564,575 |
| *Montana Power | 4,156,050 | 4,286,557 |
| *New Orleans Public Service | 1,929,526 | 1,681,475 |
| *Niagara Hudson Power and subs. | 5,583,740 | 5,378,632 |
| *Pennsylvania Power & Light | 5,451,936 | 5,755,725 |
| *Puget Sound Power & Light and subs. | 4,908,892 | 5,456,672 |
| *Washington Water Power and sub. | 2,637,311 | 2,883,338 |

*Twelve months ended March 31.
†Twelve months ended April 30.

## 700,000 Washing Machines Placed on 1945 Schedule

The War Production Board has approved a program for the manufacture of 700,000 domestic washing machines in the last half of 1945 and is expected to amend Order L-6 to allow this program to be completed. Early this week L-6 had not been so amended, but action on the order to permit the program to be carried out was said by WPB spokesmen to be assured.

It was emphasized that materials and components for domestic washers would be available in varying quantities and that it may be some time before they are in balance. No washers are expected to be available before the latter part of the year, but when they are available, they will be distributed through normal channels.

WPB is expected to use substantially the same formula for making authorizations to specific manufacturers which it set up for the refrigerator program.

With regard to materials for the approved program, which would be given priorities assistance to the extent of 700,000 units, with any other production possible under the "open-ending" of CMP proceeding on an unrated basis, WPB said aluminum would not be a bottleneck in washer production. Supply of sheetsteel and malleable and grey iron castings, now tight, might ease in the third quarter through military cutbacks. Copper strip, rod, tube, wire and castings will be available to the extent required for the approved washer program; synthetic protective finishes will not be available until unfilled military demands have been met. Washer industry men felt that only a few models would be made until production is at a reasonably high level.

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## Experts Appraise Assets at More Than Book Value

The value of the assets of the Montreal Light, Heat & Power, Cons., including those expropriated by the Quebec government, has been found to be considerably higher than those carried on the books of the company, a group of appraisal experts has found after a study of 15 months.

No exact figures were made public, but the appraisers are ready to defend their valuation at any hearing before any court or commission. The utility is insisting that its stockholders be given a fair payment for their property which was expropriated, but the issue has become a political one and the government is afraid to attempt a settlement.

# How

**DESIGN · CONSTRUCT · OPERATE · MAINTAIN**

## Automatic Timing Switch for 1-Min. Interval

By A. R. CONSTANT, Jr. and J. H. ARMSTRONG

*New England Power Co., Tewksbury, Mass.*

A switch that can be easily and economically constructed in a meter shop has been developed to provide one-minute interval contact closing. It has proven to be reliable by having been in operation more than two years without a failure. One device with which it has been used is a dispatcher's time stamp. A description of the switch follows. Very few dimensions are given because the various parts can be sizes determined by the builder.

A one-rpm. motor is mounted on a ¼-in. iron plate cut and bent as shown in Fig. 1. A 2-in. disk is attached to the motor shaft. On the periphery of this disk there is mounted a cam and a counterbalance. The cam is a small piece of ½-in. Bakelite or hard wood shaped as shown and slotted to fit over the edge of the disk.

As the motor turns the cam comes in contact with the finger under the mercury switch. The face of the cam first met is shaped so as to give a gradual tilt to the switch. This eliminates any possible slapping back and forth of the mercury in the switch and a consequent false operation. Then a sharp break of the switch is accomplished by the shape of the cam and a spring arrangement. This cam will probably have to be reshaped a few times before the desired shape is found. So that there will be as little friction as possible on the motor when the cam contacts the finger, jewelled bearings are used. To each end of the shaft, which is a ¼-in., 20-thread bolt about 2-in. long, ammeter pivots are soldered. These pivots rest in their former jewels. The jewels are mounted by taking the brass arms in which they formerly fit and attaching feet to same.

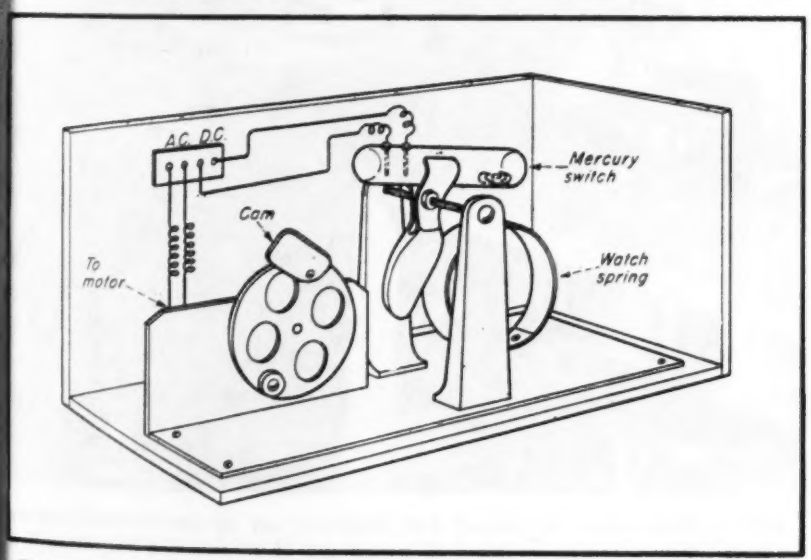


FIG. 1—General assembly of automatic timing switch

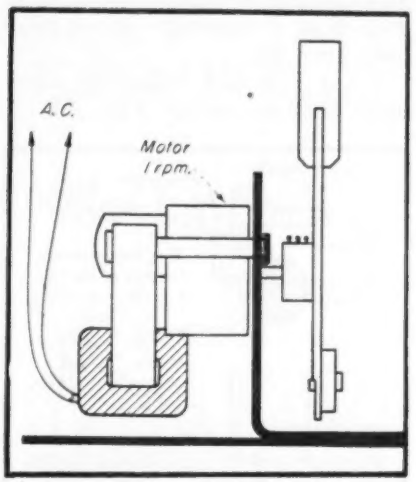


FIG. 2—Motor detail for switch

The switch is attached to the shaft by means of old fuse clips which are chosen to fit the switch and are drilled for the ¼-in. shaft. The part of the finger around the shaft is undercut so that the fuse clips can be tightened against the finger by the ¼-in., 20-thread nuts.

To make the switching-off action positive a spring return has been devised. One full turn of an old watch spring is mounted so that it will push against the finger when the latter is against the cam. The spring is held to the metal base at one place. As the finger drops off the cam, the spring gives the former a little kick and throws the mercury in the switch to the opposite end of the tube where the weight of the mercury keeps the switch open.

Two sets of leads are brought out to a Junior four-point Burke block mounted on the outside of the wooden

box in which the switch is placed. One set of leads are connected to the one-rpm. motor. The other set of leads come from the mercury switch and, in this case, go to the d.c. end of a Rectox unit.

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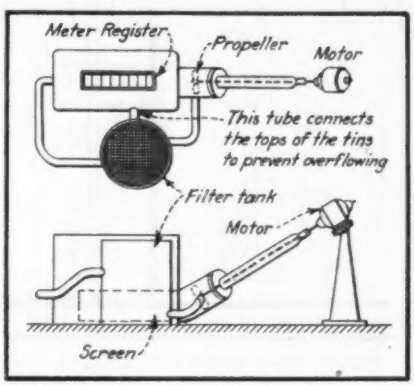
## Single-Solution Washer for Meter Registers

By J. P. DAWSON,
*Meter Engineer*
*Woodstock (Ont.) Public Utilities Commission*

This washer consists of two cans of approximately the same size—one oblong 5 in. by 3 in., approximately 4½ in. deep; one approximately 4½ in. deep, 4 in. in diameter—and a small baby food tin.

Cut a hole and solder the small baby food tin to the 3-in. side of




**THREE CANS combine to provide circulating system to wash meter registers in $CCl_4$ and naphtha**

the oblong tin at an upturned angle of about 30 deg., just so the bottom of the small tin clears the bottom of the larger one. Connect the bottom of the round 4-in. tin to the side of the small tin near its bottom with a ⅜-in. tube. Half way down inside of the 4-in. tin solder a piece of fly screen, and connect another ⅜-in. tube from the unused end of the oblong tin half way from the bottom to the top of the 4-in. round tin.

At this point there should be two tins connected together by two ⅜-in. tubes with a screen in the middle of one tin. The motor is added to the end of the smallest tin with a small tube soldered to the bottom tin. This tube is made about 4 in. long, and the shaft for the motor driven propeller goes down this tube. Because the tube is on a slant the top end of the tube is above the level of the liquid and needs no packing. The propeller is made of fairly heavy brass sheet and soldered onto the propeller shaft. The propeller operates inside the baby food tin causing the liquid to circulate in the oblong tin and find its way into the round tin. There the fluid is filtered through a milk filtering pad placed on the screen and is sucked across through the connecting tube back into the baby food tin and the cycle repeats.

We found a motor similar to a drink mixer motor to be about the right size. The fluid is a mixture of carbon tetrachloride and naptha gasoline (dry cleaners' grade). Carbon tetrachloride alone is too harsh and the naptha is too explosive—the combination gives a clean register with little fire hazard as it burns like very poor kerosene. The register need be left in the washer only about one minute, and be sure the motor causes lots of turbulence in the oblong tin.

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## New Reed Material Minimizes Errors

By DONALD E. ANDERSEN,
*Chief Engineer, J-B-T Instruments, Inc., New Haven, Conn.*

A new material having an extremely low temperature coefficient has been found for vibrating reeds used in frequency measurements. Change in calibration between minus 80 deg. F. to plus 180 deg. F. is less than 0.20 percent. Reeds under test for the past ten months have withstood more than 1.5 billion vibrations without any sign of fatigue, or change in calibration. The material has been named "Neutro-Temp."

Over a year ago a temperature test cabinet was installed at the New Haven plant of J-B-T Instruments, Inc. This unit, made by the American Instrument Co. of Silver Spring, Md., is approximately 3 ft. wide by 4 ft. long by 3 ft. high. By the use of dry ice or the built-in heater coil, the above-mentioned temperature range may be covered; automatic control permits it to be held at any point desired. Fig. 1 shows a view of the cabinet and some associated test equipment.

Extensive tests were run on the regular reed material used by J-B-T. The standard procedure was to make readings at room temperature, then at about three points below this value and at the minimum temperature to be reached. The meters were held at each point for about 45 min. before readings were taken. All frequency checks were made with standard J-B-T calibration equipment standardized against tuning fork frequency standards. (ELECTRICAL WORLD, November 27, 1943, page 7

**FIG. 1—Temperature test cabinet with equipment set up for checking frequency meters. Output sockets on the wall permit use of 15 standard frequencies from tuning fork oscillators for standardizing the oscillator**

January 8, 1944, page 92). Results indicated a temperature coefficient of approximately 75 parts per million degree Fahrenheit, negative. This agrees quite closely with the prior art in vibrating frequency meters on the market.

The problem of producing electrical indicating instruments and testers whose accuracies are not affected by temperature variation has occupied much of the time of engineers of instrument companies during the war. After considerable research and investigation of materials available which would possibly have all the characteristics required for use as vibrating reeds, a nickel steel was decided upon. Its temperature coefficient was found to be about 8 parts per million per degree Fahrenheit, negative. A change of even 100 deg. would produce a change in resonant frequency which would be scarcely noticeable. This is due to the fact that it is difficult to check the calibration of a vibrating reed much closer than 0.06 percent.

Fig. 2 shows the frequency-temperature characteristics of the new product. This new material opens up greater possibilities in the measurement of frequency. In addition to its unusual temperature characteristics,

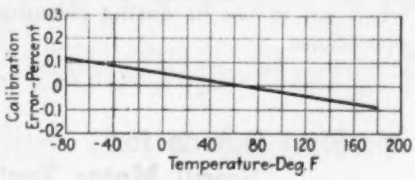


**FIG. 2—Frequency-temperature characteristics of the new vibrating reed material (a nickel-steel alloy). With a 60-cycle reed, variation would be approximately plus or minus 0.06 cycle**

the material is almost corrosion-proof. Samples have been outdoors in a detrimental atmosphere for over a year without sign of rusting and only slight staining. Samples have also been kept for weeks in an atmosphere of practically 100 percent humidity at various temperatures and still no deterioration has been found. These two points in line with its fatigue-resistant properties make for an ideal vibrating reed material for frequency meters.

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## Cumulative Duty-Score Breaker Maintenance—I

By O. E. FAWCETT
*West Penn Power Co., Pittsburgh*

Amount of duty a circuit breaker has performed commonly determines the frequency of inspections and this has little to do with the elapsed time between inspections. However, the method in use on the West Penn System since 1930 has enabled the operating department to obtain more reliable service from oil circuit breakers at an estimated saving of about 20 percent over the method of inspections based on time interval only.

Certain faults are likely to develop in an oil circuit breaker which are not dependent upon the duty of the breaker. Many companies use a power factor test at regular intervals to determine bushing deterioration. Further, certain mechanical failures such as broken pins, arms, lost cotter keys, etc., have no direct relation to the amount of duty the breaker has performed. Both these types of troubles may be detected by setting a maximum time limit after which a breaker is inspected regardless of the amount of duty it has received since the last inspection. To overcome these two difficulties on the West Penn System, bushings are tested by the Doble method annually and the maximum time which a breaker may go without inspection is three years.

The mechanics of setting up such a maintenance program are as follows: The maintenance record of each breaker is kept on a card made up for that purpose. Entries are made for each day during which operations occur. These include number of operations, which relays operated, the number of maintenance units charged against the breaker and any other pertinent data such as oil tests, power factor tests, etc. The method of determining the maintenance units will be described in an ensuing issue.

Form 1440 Rev. L-724715 — WEST PENN SYSTEM — RECORD OF OIL CIRCUIT BREAKER MAINTENANCE

| DATE | Operations | RELAYS PH. | RELAYS GD. | Maintenance Units | OIL TESTS 1 | OIL TESTS 2 | OIL TESTS 3 | DATE | Operations | RELAYS PH. | RELAYS GD. | Maintenance Units | OIL TESTS 1 | OIL TESTS 2 | OIL TESTS 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

FAULT AT BREAKER ____ Ph. ____ GRD. ____ Units ____
FAULT AT ____ Ph. ____ GRD. ____ Units ____ W. P. S. C. RATING
FAULT AT ____ Ph. ____ GRD. ____ Units ____

| STATION | CIRCUIT | TYPE | VOLTS - RATED - AMPS. | Mfg. S. C. Rating | W. P. No. |
|---|---|---|---|---|---|
| | | | | | |

**RECORD KEPT OF OPERATIONS of oil circuit breaker to determine intervals for maintenance. Entries made for each day during which operations occur**

## Convert D-14 Meters for C. T. Operation

Excess D-14 self-contained 5-amp., polyphase meters in stock at the Nebraska Power Co. meter department

**CURRENT COILS of self-contained 5-amp., D-14 polyphase meter being replaced, above, with coils of twice the turns, incidental to its conversion for current transformer use**

at Omaha, are being converted for use with current transformers by replacing the current coils of the D-14 with salvaged current coils from I-14 meters, which have double the number of turns of the D-14 coil.

The conversion, which takes between 1½ to 2 hours, is done only as need for current transformer D-14

meters arises. Only scrap meter parts and labor are required in the change.

Test constant at 240 volts of the meter before conversion is 2.40. With the original current coils replaced with coils from I-14 meters the test constant is 1.2. The converted meter carries the standard 2.5 amp. rating of a D-14 C.T. meter.

With the coils replaced it remains for the meter repairman only to rebuild the original terminal block by drilling out covers over holes, drop in the needed additional terminal lugs and reconnect.

It is, of course, necessary to use a new register with a ratio corresponding to the primary watthour constant.

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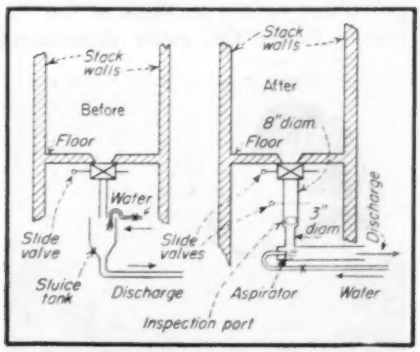
## Aspirator Scheme Sluices Fly Ash

Fly ash is removed from the stacks of the Ohio River station of Southern Indiana Gas & Electric Co., Evansville, by an ingenious sluicing system incorporating the familiar aspirator principle. Scheme is shown.




**ASPIRATOR SCHEME** sluices ash from bottom of station stack

Formerly fly ash was allowed to fall by gravity through an opening in the stack floor into a tank, with conical bottom, where it mixed with water piped into the top of the tank. This sluicing system had a tendency to clog up due to lumps in the fly ash. When such clogging occurred it was difficult to remove the obstruction without dismantling the piping.

As the system is now constituted, fly ash drops by gravity from the stack floor into an 8-in. diameter pipe through a slide valve and is drawn into the discharge line by an aspirator through a 3-in. diameter pipe connecting the two. An inspection and cleaning port at the bottom end of the 8-in. pipe permits easy removal of ash lumps that will not pass through the 3-in. pipe.

Slide valves in the 8-in. pipe and in the water line to the aspirator nozzle allows the system to be closed off when not in use or during cleaning operations.

•

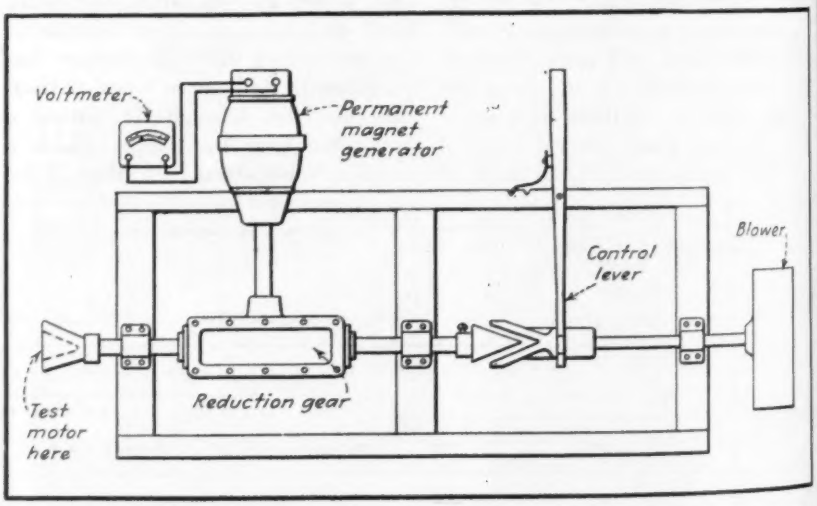
## No Shut Downs for Small Motor Test

Quick and easy method of obtaining speed characteristics, full load and no load test on small motors without shutting down to insert mechanical load has been devised by A. Skrobisch, Development Engineer, and Leonard Becker, Production Engineer of Eastern Air Devices, Inc., Brooklyn, N. Y.

For the test method a device shown in the accompanying sketch is applicable to testing small motors which have close operating specifications. The device made at the plant allows inexperienced help to perform the tests with ease and rapidity.

Mounted on the top is a permanent magnet generator (company's type J 36A) which has on the end of its shaft a gear meshing with the worm on the test shaft resulting in a 100 to 1 reduction. One hundred revolutions of the shaft produce one on the generator which develops 2 volts per revolution. Therefore, in testing the speed characteristics of a 7,200-rpm., 115-volt, 400-cycle motor the voltage reading would be 144 volts (7,200× 1/100×2).

The full-load and no-load test is obtained by placing a male rubber center point on the motor shaft and pressing it into the female nipple shown at the left of the sketch. The no-load current is obtained from the ampere meter in the motor circuit. To obtain the full-load reading the lever protruding through the top is pushed to the right making the female tip slide on the shaft to engage the rubber male center. Attached to the end of this shaft is a small blower (LR, No. 2) whose openings are so set that the motor draws its full load current of 0.28 amp.




**QUARTER-INCH SHAFT** on which are two female tips and one male tip to facilitate motor testing. Inner female tip slides on flat topped shaft to engage its male center when thrown into position by control lever. Generator mounted on top is connected to shaft by gear ratio of 100:1. Blower is attached to the inner shaft

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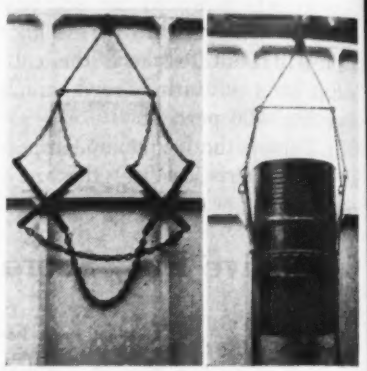
## Handy Drum Lifter for Utility Work

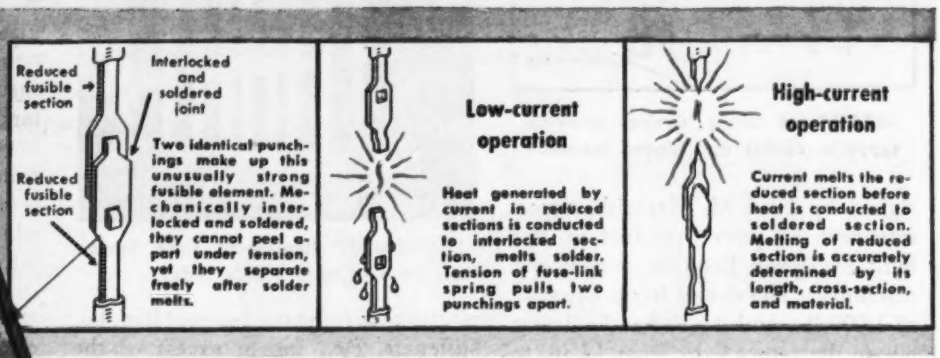
To facilitate handling oil drums and other liquid containers used by the Haverhill (Mass.) Electric Co., a New England Power System utility, the lifter illustrated herewith was de-



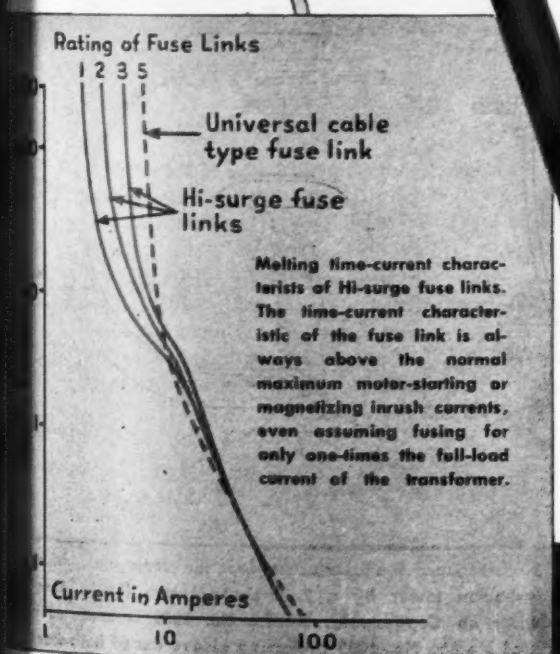
**SIDE VIEW** (a) of lifter assembly. End view (b), assembly attached to oil drum

# HERE'S A NEW FUSE LINK THAT'S REALLY DIFFERENT

## It's a double-duty fuse that reduces surge blowing and improves overcurrent protection


Reduced fusible section
Interlocked and soldered joint
Reduced fusible section
Two identical punchings make up this unusually strong fusible element. Mechanically interlocked and soldered, they cannot peel apart under tension, yet they separate freely after solder melts.
Low-current operation
Heat generated by current in reduced sections is conducted to interlocked section, melts solder. Tension of fuse-link spring pulls two punchings apart.
High-current operation
Current melts the reduced section before heat is conducted to soldered section. Melting of reduced section is accurately determined by its length, cross-section, and material.

**HI-SURGE FUSE LINKS**




Melting time-current characteristics of Hi-surge fuse links. The time-current characteristic of the fuse link is always above the normal maximum motor-starting or magnetizing inrush currents, even assuming fusing for only one-times the full-load current of the transformer.

NOW, for the first time, it is no longer necessary to choose between *proper overcurrent protection* and a *low rate of fuse blowing* caused by lightning and other surges. *You can have both* because of the double-duty characteristics of the new G-E Hi-surge fuse links.

Available in low-current 100% N-ratings of 1, 2, and 3 amperes, each having a surge-blowing characteristic of a *5-ampere* conventional fuse link.

By using them at transformer installations where you have been using a 5-ampere minimum primary fuse, you can improve overcurrent protection and keep the same freedom from blowing by motor-starting, magnetizing inrush, or lightning surges. Rechecking co-ordination with line sectionalizing devices is unnecessary.

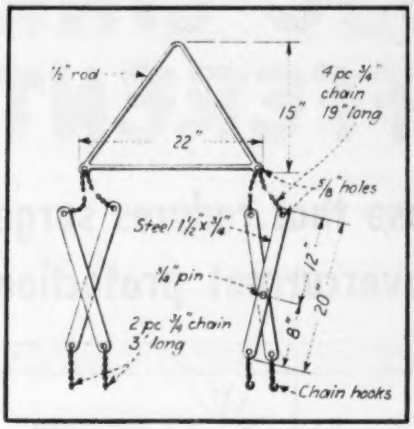
By using them at transformer installations where 1-, 2-, or 3-ampere fuses have previously been used, you can reduce blowing by surges and keep the same overcurrent protection. And, here again, usually without restudying fuse co-ordination.

These new fuse links are mechanically and, usually, electrically interchangeable with universal cable-type or flip-open fuse links now in service.

We shall be glad to send you complete descriptive and application information on this revolutionary advance in fuse-link design. Write for Bulletin GEA-4436. *General Electric Company, Schenectady 5, N. Y.*

**Buy all the BONDS you can—and keep all you buy**

**GENERAL ELECTRIC**




**DETAILS of lifting device, showing supports, chains and hinged members**

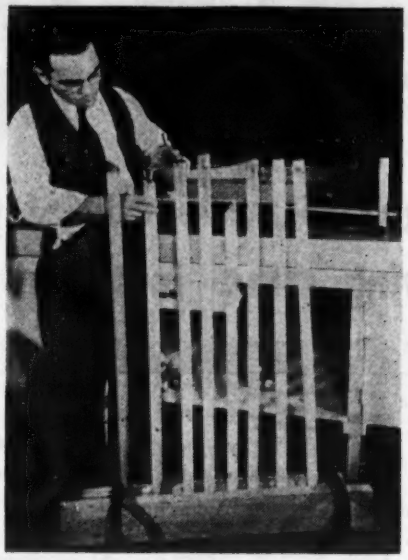
signed by Fred M. Monteith, superintendent of power production and built by Byron Popham, a company machinist. The device has a capacity of 1,000 lb., and it will handle drums whose diameters vary from 14 in. to 30 in. The arrangement of the hinged members and chains is such that the heavier the load, the greater becomes the squeeze action on the drum.

•

## Burned-out Light Tubes Serve As Molds

Burned-out fluorescent light tubes are used to mold plastic rods for a multitude of purposes at The Glenn L. Martin Co., Baltimore, Md.

The tube-mold idea was suggested, by Plastics Methods Engineer Melvin Young, who found the demand for



**BURNED-OUT fluorescent light tubes are used to mold plastic rods**

plastic rods to be used as tool handles, stiffeners, etc., far in excess of the equipment available to mold them.

In practice, one end of the burned-out tube is cut off and the tube itself is filled with a liquid Catabond or Catavar thermosetting resin, then placed in an oven for curing. The cured plastic, still in the tube, is removed from the oven and the glass broken and chipped off, leaving a perfect rod which requires a minimum of polishing and can be cut to various lengths depending on the use to which it will be put.

Since the burned-out tube had no salvage value originally, the destruction of the mold is of no consequence.

## Ground Wire Insulated Winter- Yes; Summer- No.

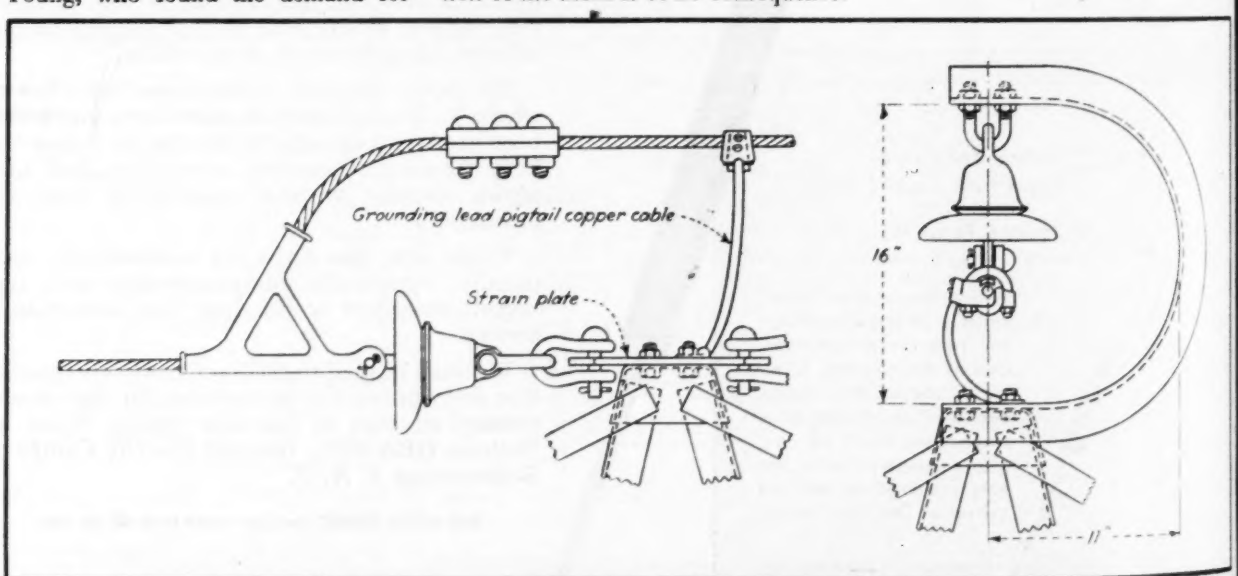
By GEORGE LANDIS
*Electrical Distribution Manager*
**Central Hudson Gas & Electric Corp.**
*Poughkeepsie, N. Y.*

Lowest possible resistance between ground wire and ground is invariably considered desirable during the lightning season. But it is not so essential during the months when glaze is likely. Consequently during the glaze season the Central Hudson System, having hung the ground wire on insulators, is in a position in the winter months to remove the connection between the ground wire and the tower. This makes de-icing operations on the ground wire possible which, in turn, prevents its sagging into the phase wires.

In the spring, a copper pigtail is attached to the ground wire by a connector and to the tower by a lug. It is left connected in this manner during the summer months for lightning protection.

In the fall, previous to glaze season, the connection is detached from the ground wire, and the connector attached to the pigtail is left dangling at the tower top until the following spring.

Thus, lightning protection and prevention of an iced ground-wire sagging into a phase wire are both achieved.




**GROUND WIRE TREATMENT at dead-end structure uses all materials of standard manufacture except the strain plate which is an 8 by 3 by ½-in. steel bar. Ground wire is supported on a suspension tower by a 7-in. channel iron (36 in. long) bent into an 8-in. semi-circle. No protecting sleeves on steel groundwire; on Copperweld, Memco No. 4009 is used. Pigtail is connected for summer service by Fargo connector with 2-in. length of Memco No. 4009 protecting sleeve tinned both sides**

# For ALL parts of town... yet ALL of one family

## NOVALUX FORM 79 LUMINAIRES

(Above) FORM 79-R Narrow, asymmetrical distribution. Especially adaptable to main arteries and highways

(LEFT) FORM 79-VR Narrow-band (180 deg) distribution—best for residential streets.

(Above) FORM 79-S Non-directional, shaded distribution for intersections and open areas

(Above) FORM 79-D Wide, asymmetrical distribution for unusually wide streets and parkways

These luminaires give you the benefits of standardization, including reduced installation and maintenance costs, without sacrificing "tailored-to-measure" lighting results.

Form 79 luminaires are basically alike, even though each type is designed to do a particular job. All have the same maintenance-saving features. They "go up" the same way. They are serviced the same way. Most replacement parts are identical. They have in common many worth while features that help keep maintenance costs low.

This standardization doesn't limit your opportunity to fit street lighting to your local situation, because the Form 79 optical system is so highly adaptable. Form 79 VR, for example, makes possible new standards of illumination from *widely spaced* units. And it offers great advantages on residential streets, keeping the light on the street, not on the houses.

G-E specialists in street lighting are at your service if you need help in planning a comprehensive modernization program. *General Electric Company, Schenectady 5, New York.*

Are you tieing-in with the NEMA plan to give America better street lighting?

**GOOD STREET LIGHTING BUILDS GOOD WILL**

Buy all the BONDS you can—*and keep all you buy*

GENERAL ELECTRIC

# HOW TO CLARIFY NETWORK LAYOUTS FOR FIELD MEN

**To facilitate understanding of alternating current network layouts by utility maintenance men and electrical contractors engaged on installation work, an Eastern power and light company's distribution department made up the accompanying diagram of feeder, secondary main and service connections on a schematic basis.**

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A valuable addition includes comparisons of copper requirements for equal loads and equal percentage drops in voltage for various secondary set-ups, and comparative voltage drops for equal loads and equal copper sizes.

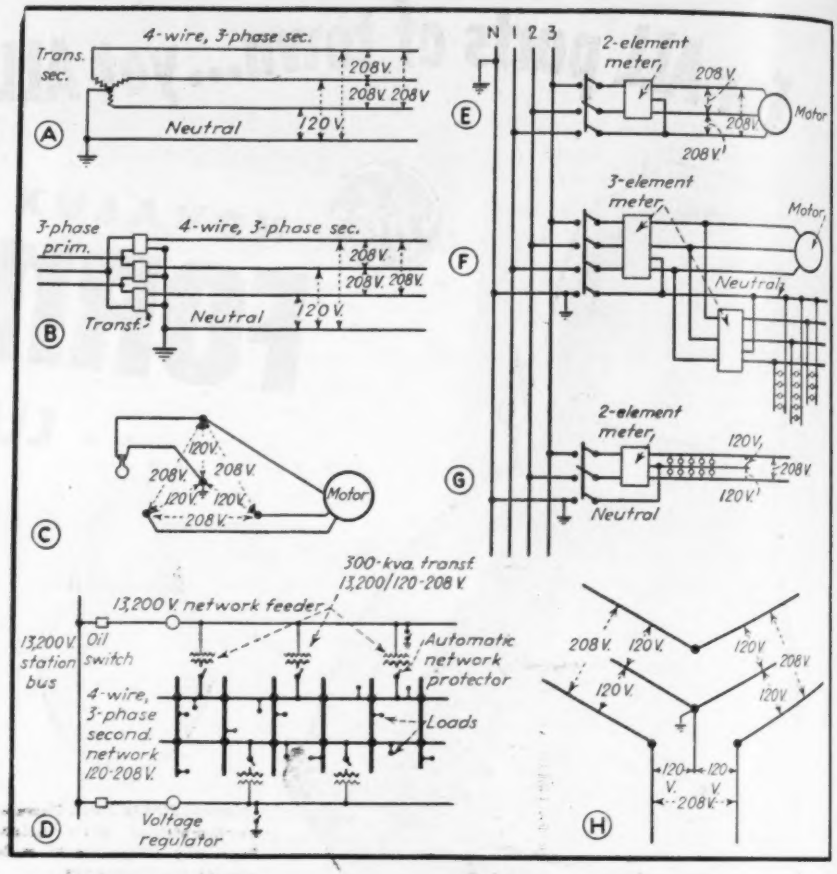



FIG. 1 (above)—Schematic diagrams show principal electrical characteristics of a.c. network feeders, secondary mains and services: (A) Service supply; (B) Primary and secondary connections; (C) Load connections; (D) General layout from station bus to load; (E) Metering 3-phase power load; (F) Metering total load and 120-volt light load on all three phases; (G) Metering light load on single-phase 3-wire service; (H) Service voltages

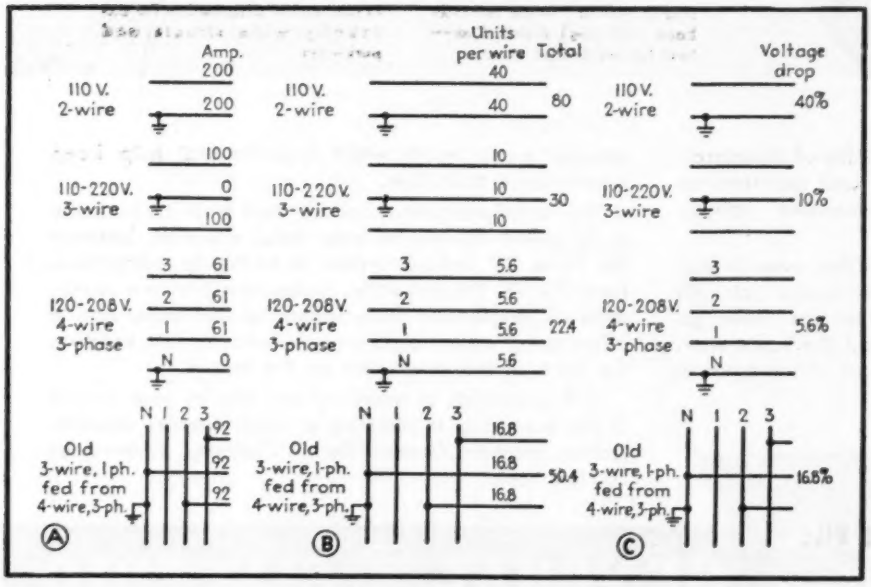
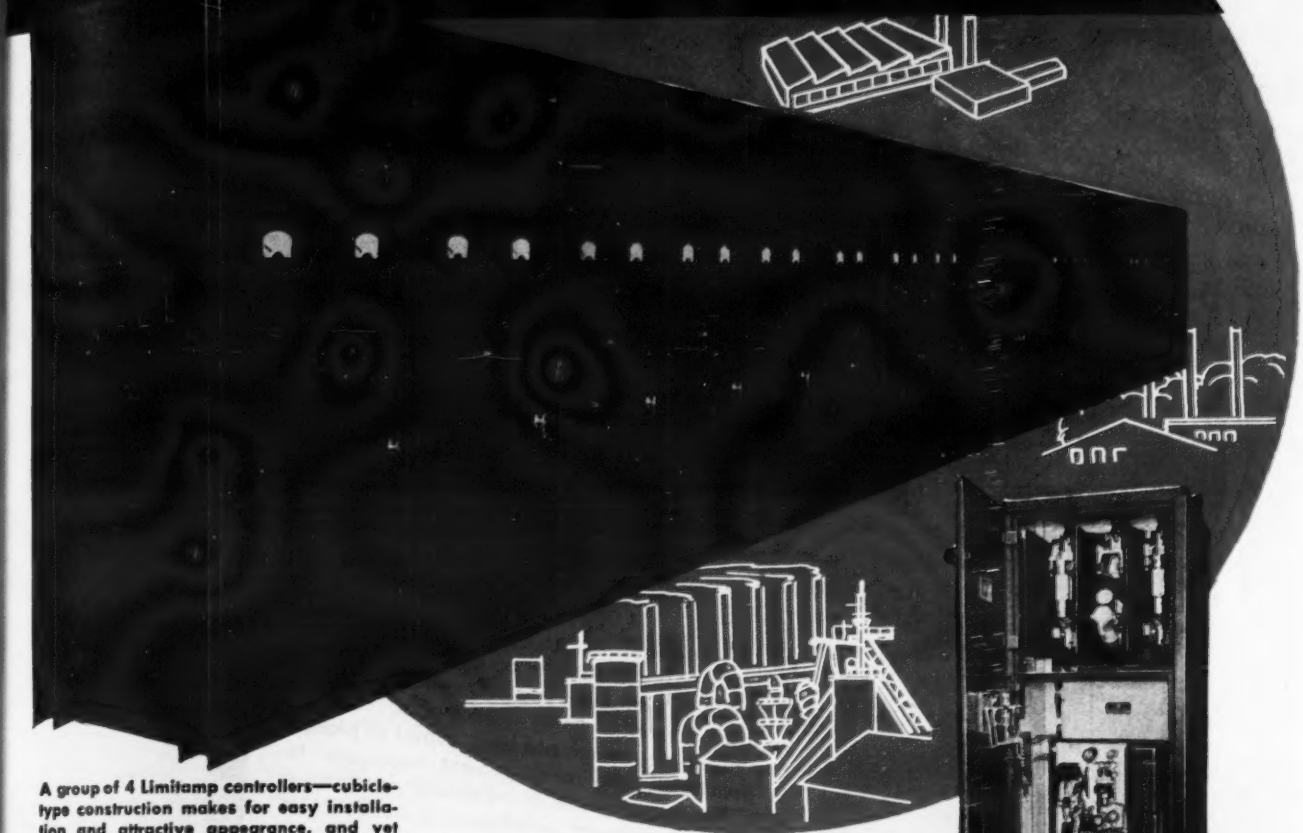


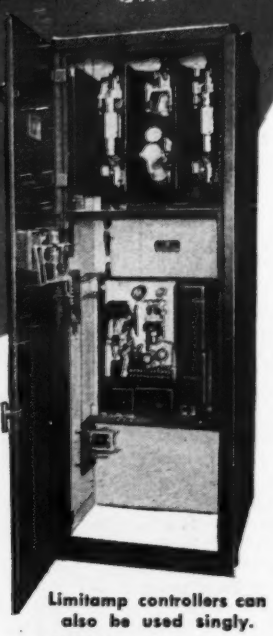

FIG. 2 (left)—Comparisons of various secondary set-ups: (A) Copper requirements for equal loads; (B) Copper requirements for equal loads and equal percentage in voltage drop; (C) Voltage drop for equal loads and equal copper sizes

# 2300-VOLT PACKAGED CONTROL FOR SURE, SHORT-CIRCUIT PROTECTION



A group of 4 Limitamp controllers—cubicle-type construction makes for easy installation and attractive appearance, and yet takes a small amount of floor space.

## Factory-assembled Control Offers You 3 Important Savings



Limitamp controllers can also be used singly.

**1.** *Simplifies Purchasing and Layouts*—When you specify G-E Limitamp control, you save hours for your engineers, buyers, and draftsmen—our engineers have assumed full responsibility for selecting and assembling the correct control components for you.

**2.** *Saves Installation Time and Space*—Instead of many separate devices, you install only one control board. You just have to put the preassembled group control in place and connect the incoming and outgoing motor leads, and it's all set to go to work.

**3.** *Saves Critical Materials*—These starters help you save the vital materials that would otherwise be used for buses, conduit fittings, and wire connections.

### ½-cycle Operation Means Safety

Limitamp control will stop high-voltage fault currents in one-quarter cycle, and clear them in less than one-half cycle—reducing the effect of the short circuit on your motor or control.

### Other Advantages, Too

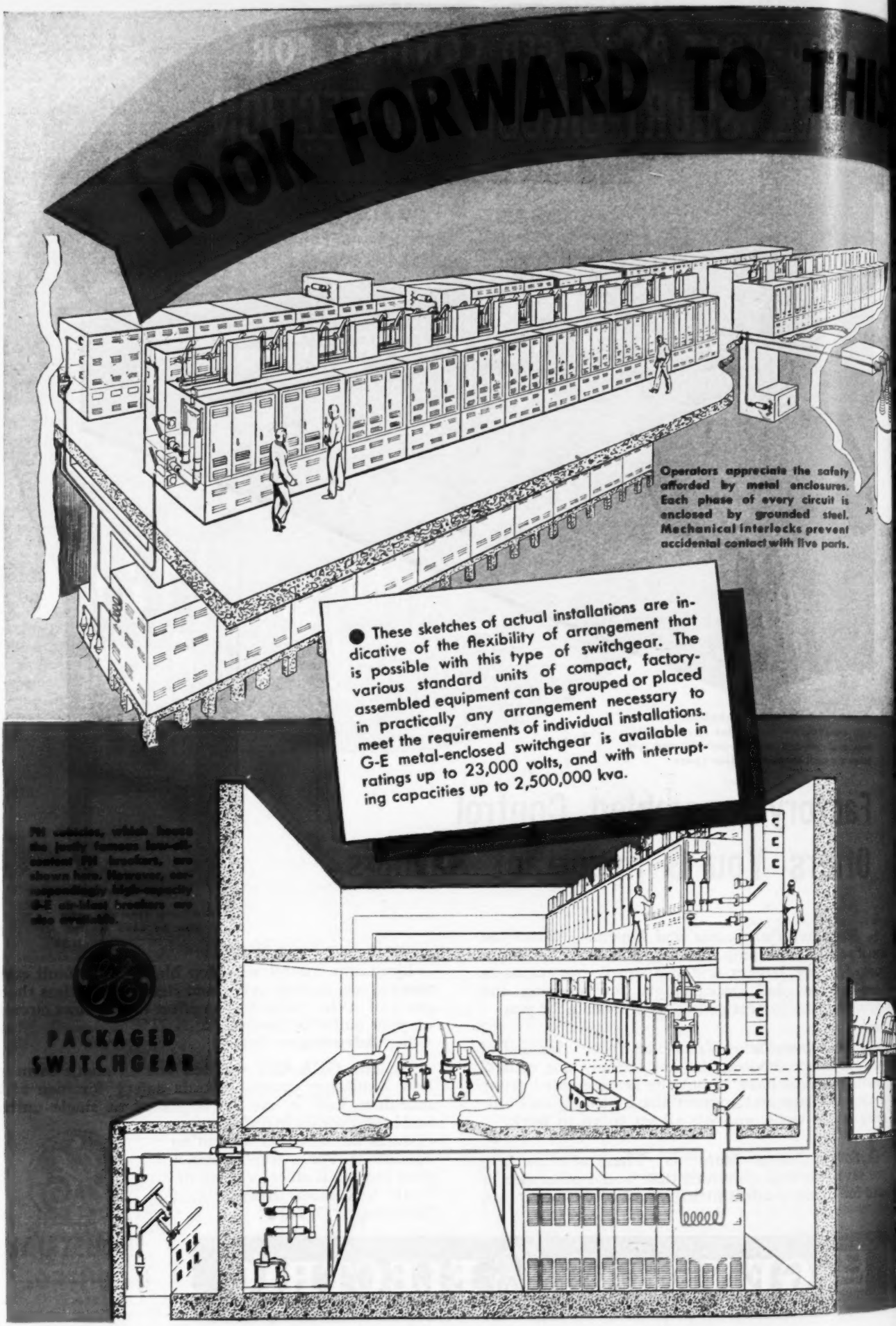
Bulletin GEA-4247 will tell you all about them—how Limitamp control affords safety for men and machines, how it can be furnished as single units, and how it comes in different enclosures for different operating conditions. For a copy, contact your local G-E office or write directly to General Electric Co., Schenectady 5, N. Y.

BUY WAR BONDS

GENERAL ELECTRIC

676-165-8900

INDUSTRIAL CONTROL


LOOK FORWARD TO THIS
Operators appreciate the safety afforded by metal enclosures. Each phase of every circuit is enclosed by grounded steel. Mechanical interlocks prevent accidental contact with live parts.
● These sketches of actual installations are indicative of the flexibility of arrangement that is possible with this type of switchgear. The various standard units of compact, factory-assembled equipment can be grouped or placed in practically any arrangement necessary to meet the requirements of individual installations. G-E metal-enclosed switchgear is available in ratings up to 23,000 volts, and with interrupting capacities up to 2,500,000 kva.
PACKAGED SWITCHGEAR

# YPE OF SWITCHGEAR

## Installed Cost Definitely Predictable!

THE basic units of G-E metal-enclosed switchgear, like letters of the alphabet, can be combined in literally thousands of practical arrangements. This versatility enables you to meet any reasonable set of requirements without resorting to "specials."

**You get the manifold benefits of standardization and repetitive manufacture**

By selecting standard, packaged switchgear and associated apparatus, you avoid the detailed engineering and drafting of minor equipment. You get the assurance of proper operation, because the complete equipment is factory-assembled and tested—equipment that is approved by users throughout the world.

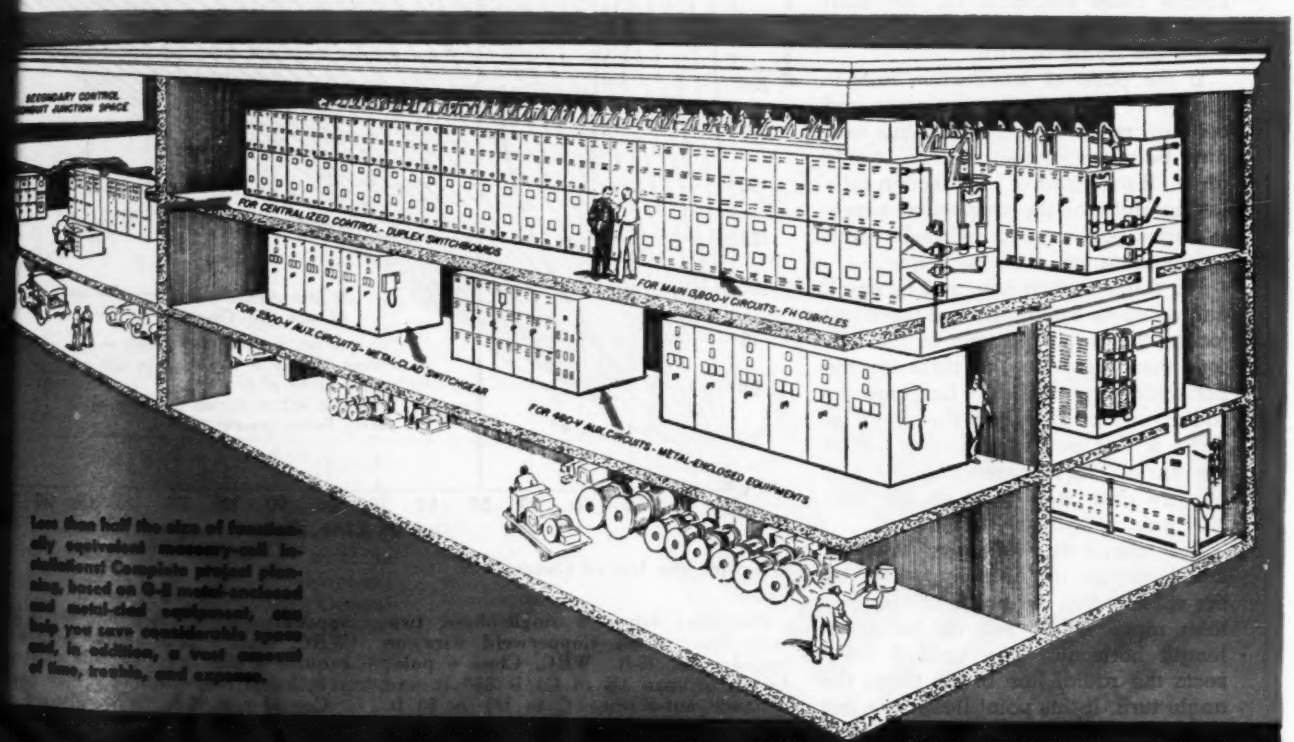
Installation of this type of equipment is always much easier, faster, less of a manpower problem, and less costly than on-the-spot piecemeal installations. Standard, metal-enclosed units are delivered in complete sections—need only to be fastened in place and connected.

**One responsibility insures two important extras**

When you place the responsibility for your entire installation with one reliable manufacturer, you automatically eliminate a vast amount of detail and clerical work. In addition, you are assured that the equipment you select will be co-ordinated at the factory in *three* ways: electrically, mechanically, and physically. You get matched equipment that not only works properly but looks right.

Ask your G-E representative for complete information on factory-assembled, ready-to-install primary-switchgear equipments. *General Electric Co., Schenectady 5, New York*

Buy all the BONDS you can—and keep all you buy


FOR CENTRALIZED CONTROL - DUPLEX SWITCHBOARDS
FOR MAIN 13,800-V CIRCUITS - FH CUBICLES
FOR 2300-V AUX. CIRCUITS - METAL-CLAD SWITCHGEAR
FOR 480-V AUX CIRCUITS - METAL-ENCLOSED EQUIPMENTS

GENERAL ELECTRIC

# HOW TO DETERMINE PERMISSIBLE ANGLE OF TURN WITHOUT USING SIDE GUYS ON POLES

By FRANK R. WAUGH, Engineer, The Toledo Edison Co., Fremont Division, Fremont, Ohio

Chart has been designed primarily for use in construction of single-phase primary and secondary rural lines with two-wire, pole-top crossarm construction along curving roads, where right-of-way does not permit side guying, in the heavy loading district with ½ in. of ice, 8 psi. wind pressure. Curves are for Western Red Cedar poles and Copperweld (CW) and hard-drawn, solid, bare (HDSB) conductors.

### Procedure

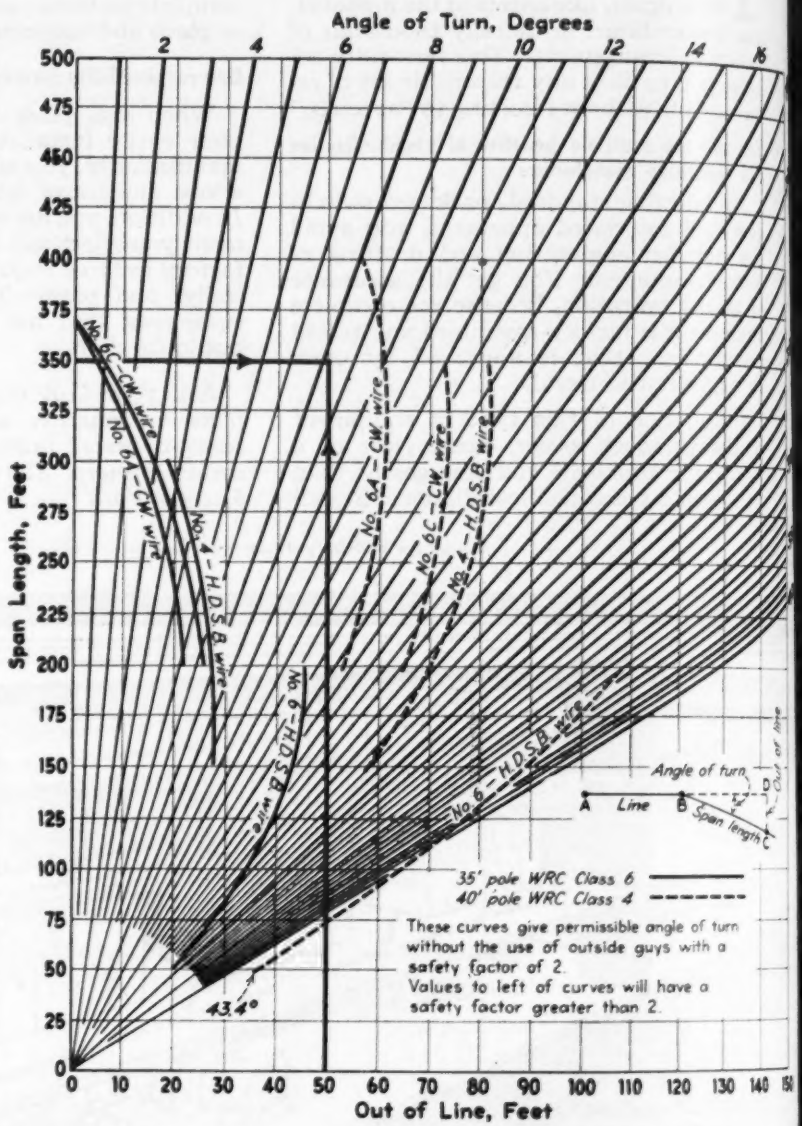
Following procedure is outlined for use of the chart for two-wire circuits. Referring to the diagram the points A, B and C represent pole locations with a turn in the line on pole B.

Measure the span length B to C and the distance out-of-line C to D. Locate these distances on the chart and where the lines intersect determine the angle of turn.

If the point of intersection falls to the left of the curve for the poles and conductors used on the line, this turn may be taken without the use of side guys. If the point of intersection falls to the right of the respective curve, a larger pole may possibly be used to eliminate use of the side guy.

For three-wire circuits and on small angles up to 5-deg. turn, on the chart locate the angle of turn in the line and then move to the right on the horizontal span-length line to the radial line of 1.5 times the angle of turn. If this point lies to the left of the curve corresponding to the size of wire and poles used on the line, side guying will not be required.

For single-wire circuits and on small angles up to 5-deg. turn, on the chart locate the angle of turn and then move to the left on the span-length horizontal line until it intersects the radial line of 0.5 times the angle turn. If this point lies to the left of the curve corresponding to the conductor size and pole used on the line, side guying will not be required.




### Example for Use of Chart

*Problem:* Given a single-phase, two-wire line of 6A Copperweld wire on crossarm of 35-ft., WRC, Class 6 pole; length of span (B to C) is 350 ft. and distance out-of-line (C to D) is 50 ft. Will pole (at B) require side guying?

*Solution:* From the respective curve it is apparent that the angle of turn is approximately 8.2 deg. and that a 35-ft. WRC, Class 6 pole at this point would require a side guy (it will stand only a 0.75-deg. turn without a side guy).

Consider a 40-ft., WRC, Class 4 pole at point B. The curve for that size pole and No. 6A Copperweld wire shows that a turn of 10 deg. may be made safely without a side guy.

# G-E WHITE RIGID CONDUIT

## For Utmost Wiring Protection . . . Where Conditions Are Severe

G-E White high-quality Rigid Conduit with its hot-dipped zinc coating gives permanent protection to wiring — helps to prevent electrical breakdowns. It is heavily zinc coated inside and outside by immersion in molten zinc — the hot-dipped galvanizing method. It is the only conduit made which has a wiped zinc interior surface for easy wire pulling.

G-E White is easy to install. It has accurate threads. Its smooth interior surface aids wire pulling.

This method provides the most durable coating of pure zinc that can be applied by any process. In addition, G-E White has a coating of baked Glyptal inside and out. This conduit is resistant to heat, flame, cold, moisture, gas, alkalies and mechanical injury.

### G-E BLACK RIGID CONDUIT

G-E Black Rigid Conduit has a tough enamel coating baked on. This coating provides a durable protection particularly for interior use and is recommended for use where exposed to chemical corrosion.

### G-E BUILDING WIRES AND WIRING DEVICES

The G-E wiring materials line also includes building wires and wiring devices for every purpose: Flamenol* Types SN and SNW small diameter building wires, other wires; switches, outlets, lampholders, fuses, etc.

*Reg. U.S. Pat. Off.

**FOR FURTHER INFORMATION** on G-E White or Black Rigid Conduit or on G-E Building Wires and Wiring Devices, see the nearest G-E Merchandise Distributor or write to Section CDW 544-9, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news Monday through Friday 6:45 P.M. EWT, CBS.

***BUY WAR BONDS AND KEEP THEM***

**GENERAL ELECTRIC**

# 4 steps to Better Postwar Commercial Lighting

The prior claims of war production are a necessary limitation on all activities looking to the development of postwar markets. Within those limitations, which all of us recognize, the lighting industry has an obligation to prepare now for its share in the task of stimulating postwar business activity and providing postwar jobs. Commercial lighting will be the spark—hence the program outlined on these pages.

"To make G-E Lamps STAY BRIGHTER LONGER" The constant aim of G-E Lamp Research
G-E MAZDA LAMPS
GENERAL ELECTRIC
G-E MAZDA LAMPS
GENERAL ELECTRIC

## 1 G-E SPONSORS NEW LIGHTING IDEAS

A score of the nation's outstanding architects and industrial designers have been commissioned by G-E to suggest creative new lighting ideas for postwar commercial establishments. Fixture manufacturers already are at work to put many of these ideas into attractive new fixtures that will add to your postwar lighting profits.

## 2 G-E PROMOTES NEW LIGHTING MARKETS

Two out of three storeowners are planning to modernize their lighting. They want lighting that says "Come in and Buy!" New G-E Mazda Fluorescent Lamps will make higher standards of store lighting easier to sell. The new lamps will include both slimmer, longer tubes and circular shapes.

## 3 G-E DEVELOPS NEW LAMPS

New G-E Mazda Fluorescent Lamps will make higher standards of store lighting easier to sell. More than ever before the lighting of the postwar store will say "Come in and Buy!" New G-E Fluorescent Lamps will include both slimmer, longer tubes and circular shapes.

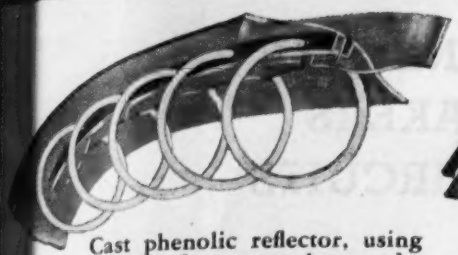
## 4 G-E WILL HELP TRAIN YOUR SALESMEN AND SUPPLY YOU WITH TESTED SALES AIDS AND DIRECT MAIL

Sales help where you need it! Training salesmen will be a job that needs doing quickly and well. General Electric's training program for lighting salesmen will be simple, interesting, and flexible enough to meet the needs of one man or a hundred. Direct mail sent out over your signature will help you line up business prospects, and sales aids will clinch orders. All this material will be available as soon as conditions permit.

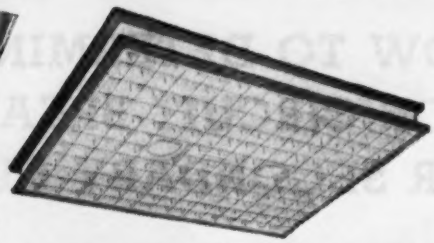
BUY WAR BONDS AND HOLD THEM

**G-E MAZDA LAMPS**

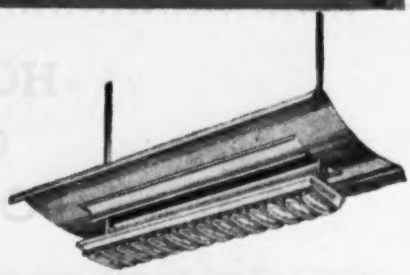
Hear the G-E radio program "The G-E All-Girl Orchestra", Sunday 10:00 p.m.



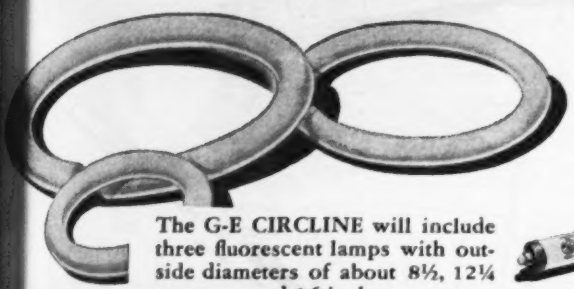
Cast phenolic reflector, using circular fluorescent lamps, designed to direct store traffic.



Fluorescent unit with adjustable spotlights for highlighting displays.



Four-lamp fluorescent luminaire suggested for grocery store.



The G-E CIRCLINE will include three fluorescent lamps with outside diameters of about 8½, 12¼ and 16 inches.

The G-E SLIMLINE—four new slimmer fluorescent lamps up to eight feet in length.

...ding training organization is helping ...n G-E's training program.

**New sales** aids will help your salesmen make persuasive demonstrations.

**G-E** will offer you a wide choice of direct mail to reach store lighting prospects.

# GENERAL ELECTRIC

*EWT, NBC; "The World Today" news, Monday through Friday 6:45 p. m. EWT, CBS; "The G-E Houseparty," Monday through Friday 4:00 p. m. EWT, CBS.*

# HOW TO DETERMINE SIZE OF CIRCUIT BREAKERS FOR SECONDARY CIRCUITS

By J. V. McGUIRE, Engineer, Electrical Department, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Nomogram has been designed to select the interrupting capacity of low-voltage air circuit breakers. It has been constructed from A.I.E.E. standard formulas for the determination of short circuit currents. Following facts must be known: Kva. rating, percent impedance and secondary voltage of transformer, also short-circuit capacity of primary lines at terminals of transformer, and connected motor loads.**

**Lower graph indicates the continuous rating for a circuit breaker based on the interrupting current rating; the latter rating being determined by the corresponding shaded section in the nomogram immediately above the graph.**

Following instructions outline the steps for use of the nomogram and graph.

### For Main Breaker

1. Place a straight-edge on the values of the transformer kva (A) and of the secondary voltage (B), at the top of the nomogram.

2. Find, at intersection (C) of heavy graduated line, correct breaker size for the main breaker, also transformer full load secondary current.

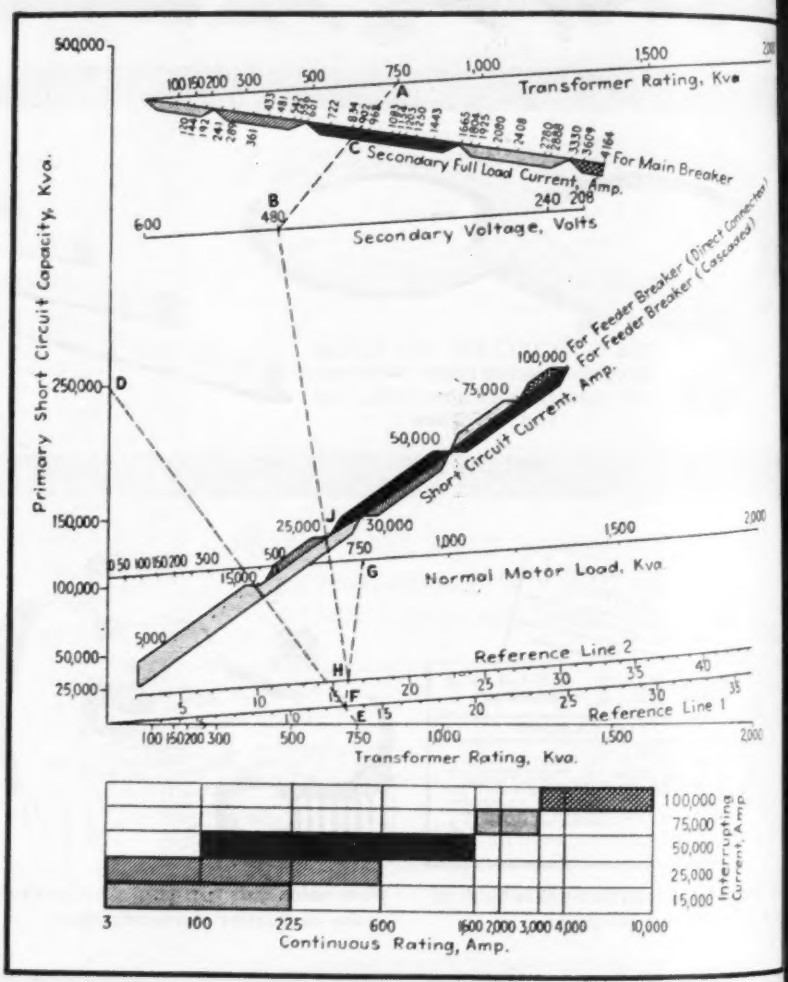
### For Feeder Breaker

1. Place a straight-edge on the value of primary short-circuit capacity (D) and on the transformer rating (E), finding a point (F) on reference line 1.

2. Using this point (F) and the kva of normally connected motor load (G), find a point (H) on reference line 2. Motor load may vary from zero kva to the full transformer rating (100 percent motor load is usually assumed for 240,-480 and 600-volt systems and 50 percent motor load for 120/208-volt systems.)

3. Using point (H) on reference line 2 and the value of the secondary voltage (B), the rms value of the secondary short-circuit current (J) will be found as well as the breaker with the correct interrupting capacity for direct-connected or cascaded feeder breakers.

4. Check continuous current ratings of breaker sizes to be certain that breakers with necessary interrupting capacity as determined by the nomogram have adequate continuous current carrying capacity. The load on each feeder circuit determines this current.




**NOMOGRAM AND GRAPH** for selecting capacity of air circuit breakers

*available now...*

# the NEW

## Westinghouse 100-Ampere Type EA Fuse Cutout

**ONLY WESTINGHOUSE EA CUTOUTS OFFER *ALL* THESE ADVANTAGES:**

**PORCELAIN-ENCLOSED FOR SAFETY.** Prestite porcelain provides dimensional fidelity, and assures interchangeability of doors: dropout and non-dropout fuse doors, disconnect blade doors.

**COMPLETE HOOKSTICK OPERATION** for extra safety. Door is easily inserted or removed, opened or closed with hookstick . . . no danger of contact with live parts.

**FEWER JOINTS IN CURRENT PATH** result in cooler operation, less maintenance and longer life. Two to seven less joints in current path than in other cutouts.

**NON-SWELLING FUSE TUBE** cuts maintenance, increases life. Fiber lining (to help extinguish arc) is enclosed in moisture-proof Micarta.

**FULL 180° DROPOUT** removes fuse holder from both contacts after interruption. Blown fuses are readily spotted on the line.

Latest addition to the line of EA Fuse Cutouts is this 100-ampere unit. This husky job contains all the exclusive advantages of other EA types plus the strength demanded for extra-heavy duty.

Extra large hookeye on door permits quick, free opening with gloved hand. Joints in the current path have been reduced to a minimum, eliminating the primary cause of overheating. These features typify Westinghouse attention to detail. Decades of cutout experience under all conceivable conditions and constant improvements by Westinghouse engineers have made the Type EA Cutout unsurpassed for reliability, long life and easy re-fusing.

Ratings of EA Cutouts are 50 and 100 amperes at 5 and 7.5 kv. Phone your Westinghouse office for further information, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60583

**Westinghouse** TYPE EA FUSE CUTOUT

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

## Outdoor Capacitor Units Given Zinc Finish

By R. E. MARBURY,
*Engineer*
*Westinghouse Electric Corp.*
*East Pittsburgh, Pa.*

Development of a galvanized finish for capacitor cases minimizes the need for removing pole-mounted capacitor units at intervals of two to six years,

**ZINC FINISH applied to outdoor capacitor. Surface of unit is roughened and then zinc sprayed to thickness of 5 to 8 mils**

depending on the location, for the purpose of cleaning and repainting. The capacitor units when exposed to the elements may, for comparative purposes, be considered in about the same category as galvanized line hardware. In fact better than that category by a factor of three or more because the line hardware has a relatively thin coating of zinc when applied by the hot-dip method. Further comparisons herewith are made with hot dipped galvanizing largely because everyone is familiar with the usual galvanized finish. Actually a hot dipped galvanized finish could not be applied to a capacitor because of the temperature involved.

### *Finish Process*

The new finish, known as No. 170M and applied to Westinghouse industrial and pole-mounted types of capacitors (see illustration) consists of first producing a rough surface by blasting the completed unit with carborundum and then coating it to a thickness of 5 to 8 mils with pure zinc by the Schoup spray process. Several passes are made in different directions to obtain a uniform coating.

In this process the steel surface of the case is made very irregular by the sand blasting. Then the zinc is deposited in a vaporized form so that it fills into those irregularities and builds up a coating which has no tendency to scale off as sometimes happens when large crystals form in the cooling of hot-dipped zinc. By the blasting and spray method the bond between the steel and zinc is even better than with hot-dipped galvanizing.

Since the thickness of zinc on hot galvanized surfaces is usually not over 0.002 in., and the sprayed zinc finish on capacitors is 0.005 to 0.006 in., the life of the capacitor finish should average up to three times the life of hot dipped galvanized parts. The life of zinc coatings has been shown to be proportional to the weight of zinc and independent of the method of application.

Unlike hot-dipped galvanized surfaces this surface can be painted at any time if desired, but for the pole mounted distribution circuit capacitor no paint finish is used.

Zinc-coated steel has the advan over steel coated with other metals for example lead, because zinc anodic with respect to steel. Even the zinc coating is scratched the posed steel will not rust as long as zinc is present in close proximity the scratch, because in the electrol activity that takes place the base me is protected by the presence of zinc.

•

## Manhole Sheave Eases Cable Pulli

A simple but effective tool devi for underground maintenance by Philadelphia Electric Co. is the ma hole sheave. It is made up of wrought iron ring with a

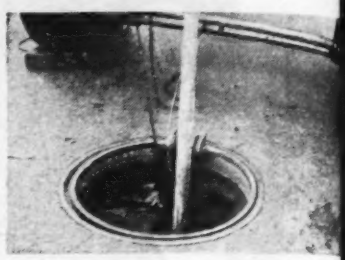


*Photo by R. M. B*

**FIG. 2—Pulling cable by use of sheav**

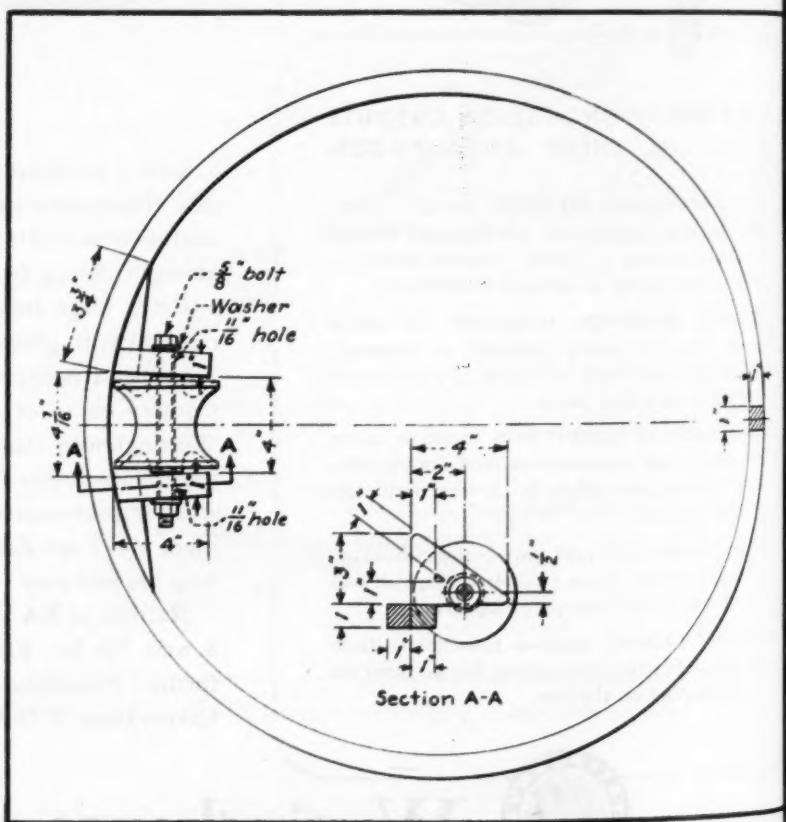



**FIG. 1—Manhole sheave is made of 1-in. by 1-in. wrought iron bent into a 29½-in. ring which fits snugly into manhole casting. All joints are welded**

**No matter what Paint Vehicle is needed . . .**

- SYNTHETIC RESINS
- NATURAL RESINS
- MODIFIED SYNTHETICS
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# RED LEAD'S WIDE COMPA

## makes its Extra Rust Protection Available

The fact that Red Lead is generally accepted throughout industry as the standard metal protective paint indicates two things:

1. *That it must be widely adaptable to various service conditions.*
2. *That it must offer something* EXTRA *in the way of rust prevention.*

Red Lead's versatility is due principally to its compatability with the wide range of vehicles needed to answer present-day service demands. It can be used with practically every type of paint vehicle on the market—synthetic resins, natural resins, drying oils, and combinations of these.

Thus, paints for any metal protective purpose can be formulated with Red Lead. Since almost any paint vehicle can be used with Red Lead, a broad range of drying requirements can be met—anything from the normal drying primer used on structural steel to the quick-drying paint essential to present-day production schedules.

### Why Red Lead means Extra Rust Protection

Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble lead salts at the approximate rate at which the acids are supplied.

This is true whether the acid originates from acid-forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust-inhibiting condition is maintained with a Red Lead paint.

Red Lead also forms an adherent protective shield which prevents electrochemical action, another prime cause of rusting.

### Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

**Write for New Booklet**—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas—ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

* * *

*All types of metal protective paints are constantly being tested at National Lead's many proving grounds. The benefit of our extensive experience with paints for both underwater and atmospheric use is available through our technical staff.*

**NATIONAL LEAD COMPANY:** New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston, W. Va. (Evans Lead Division).

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## Meets Fully All Requirements for:—

SERVICING Street, Highway and Signal Lights...Trimming Trees ...Maintenance and Line Construction Work and Emergency Calls.

Here's equipment that assures real savings of time, energy and money — One man operated, swiftly and accurately spotted, extends over parked cars, will not interfere with traffic and affords operator maximum safety and convenience.

"AMERICAN" Revolving Aerial Ladders have always been "Tops" in Engineering and Construction and the improvements incorporated in the new design assure the maximum in efficiency, ease of handling and low cost operation.

Important in the improvements is the new spring counter-balancing design, which effectively balances the ladder in all positions, so that with a slight uniform force it can be swiftly, smoothly and easily erected, regardless of angle of ladder or frame.

Write for details and specification.

BUY MORE WAR BONDS . . . *and HOLD THOSE YOU HAVE*

THE American COACH & BODY CO.

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

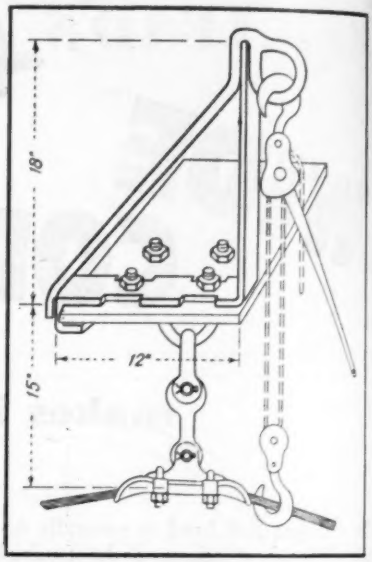

diameter concave wheel fastened to brackets which are welded to the ring.

This ring is of such a size it makes a snug fit in the casting. In pulling the winch line is kept at a shallow angle, and the ring has no tendency to pop out. The two accompanying illustrations show the simplicity of design and ease of mounting the manhole sheave.

•

## Lifting Bracket Aids Hardware Replacement

A triangular steel bracket has been helpful in changing transmission line protective ground wire hardware by Public Service Electric & Gas Co., Newark, N. J. It is a joint development by William Floyd and William Cornwell, transmission line patrolmen.




**TRIANGULAR BRACKET** facilitates use of ratchet hoist for lifting ground wire to change hardware

The device, shown in the accompanying sketch, is attached to the protective ground wire crossarm at the top of the steel transmission line towers by two bolts, utilizing two open bolt holes already in the plate. When the bracket is in place, the eye is offset and elevated in such a way that one end of a ratchet hoist can be attached to the eye and the other end to the wire. The operation of the hoist then easily raises or lowers the wire as desired.

Use of the bracket simply and easily provides the required height to insert the hoist; this simplifies the

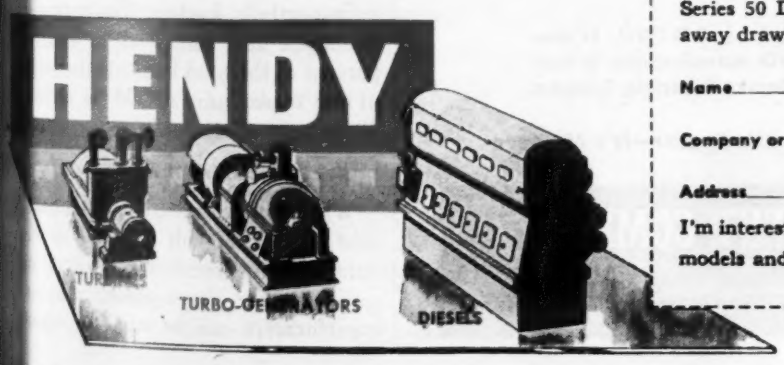
antom view shows lube-oil path in red

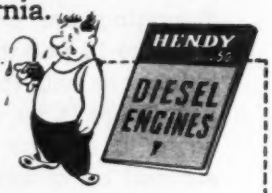
# "Put DOWN that oil can, Lube-oil Reuben!"

No need to hand-oil any part of a Hendy Series 50 Diesel! It's completely enclosed, so *all* parts are oiled from the pressure-lubrication system . . . automatically . . . in correct amounts, neither too much nor too little.

Series 50 Diesels have advantages never before combined in a single design. Besides full pressure lubrication, they have overhead camshafts, unit fuel pumps and injectors, oil-cooled pistons, and many other features.

Now, for the first time, you can have the benefit of *all* these features in *one* tested and reliable Diesel. For complete information, mail the coupon today to Joshua Hendy Iron Works, Sunnyvale, California.




**Send for NEW Diesel Booklet**
**No Obligation**

**JOSHUA HENDY IRON WORKS**
**SUNNYVALE, CALIFORNIA**

Mail me your new booklet that completely describes the Series 50 Diesel, with photographs and cross-section cut-away drawings showing the design of all major parts.

**Name**_____ **Position**_____

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I'm interested in Marine ☐ Stationary ☐ Diesel-electric ☐
models and in hp ranges from 190-250 ☐ from 250 up ☐

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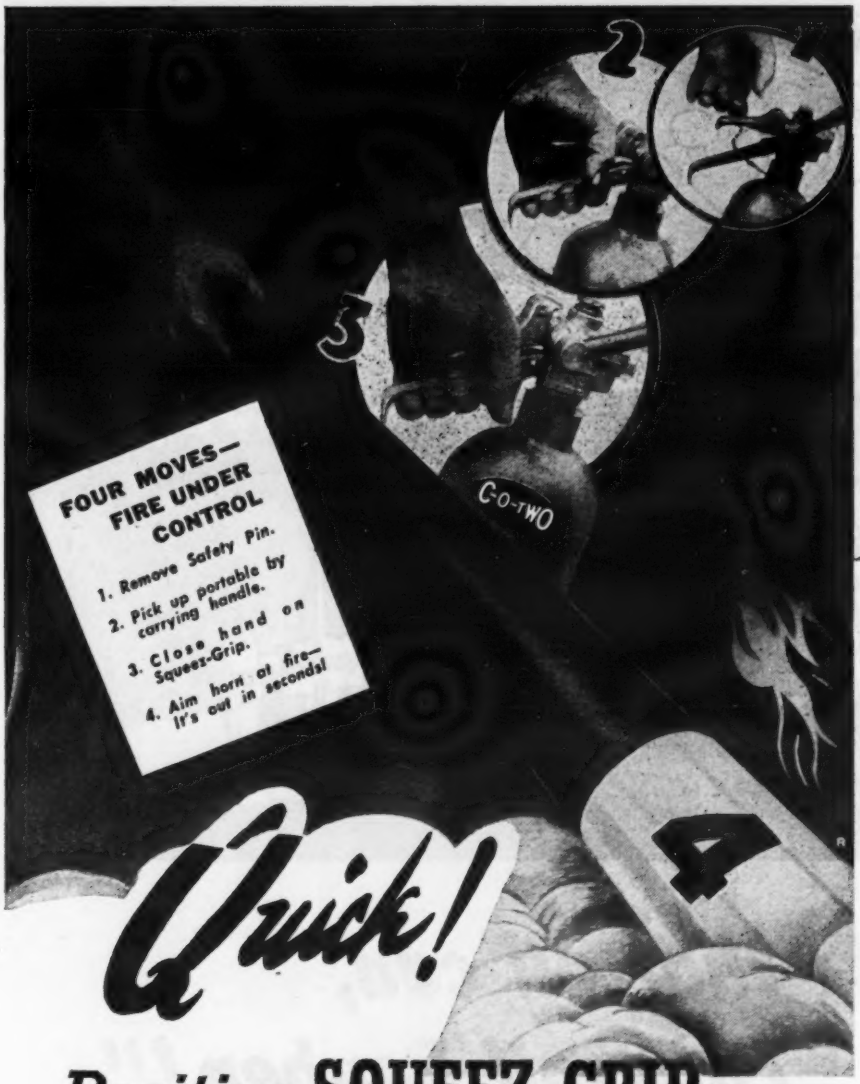


# *Positive* SQUEEZ-GRIP *KILLS FIRE in seconds*

Here in four simple hand movements we come to grips with modern fire protection. Carbon dioxide gas, the fastest non-damaging fire extinguishing agent, is stored under high pressure in portable cylinders. The rapid release of the fire killing gas with the new SQUEEZ-GRIP valve saves time and gas. There is no wheel to turn. No need to set the cylinder down to operate it. C-O-TWO gas can be discharged or stopped as quickly as you can close or open your hand. In fact, it's so easy to use that even a woman or a child can operate it and extinguish a fire in seconds.

**SQUEEZ-GRIP, originated and developed by C-O-TWO, is now used by all the Armed Forces. C-O-TWO manufactures a complete line of Portables, Hose Units and Smoke Detecting Systems.**

**KILLS FIRE—SAVES LIVES—*It's Safer—It's Faster—It's Modern***

**C-O-TWO FIRE EQUIPMENT COMPANY**
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Sales and Service in the Principal Cities of United States and Canada
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

raising and lowering operations the wire and enables one man to the job more rapidly and with hazard than heretofore.

Other methods of lifting the were formerly used. One method by means of a long J-bolt which hooked under the wire at one end fastened to the tower crossarm at the other, and then drawn up turning the bolt and nut. This slow and in many cases mechanical unsatisfactory.

Another method was to attach rope to ground wire, run it through a block at the ground wire crossarm level, and then pull on the rope from a lower crossarm.

•

## Dry Type Transformers Do Special Jobs—I

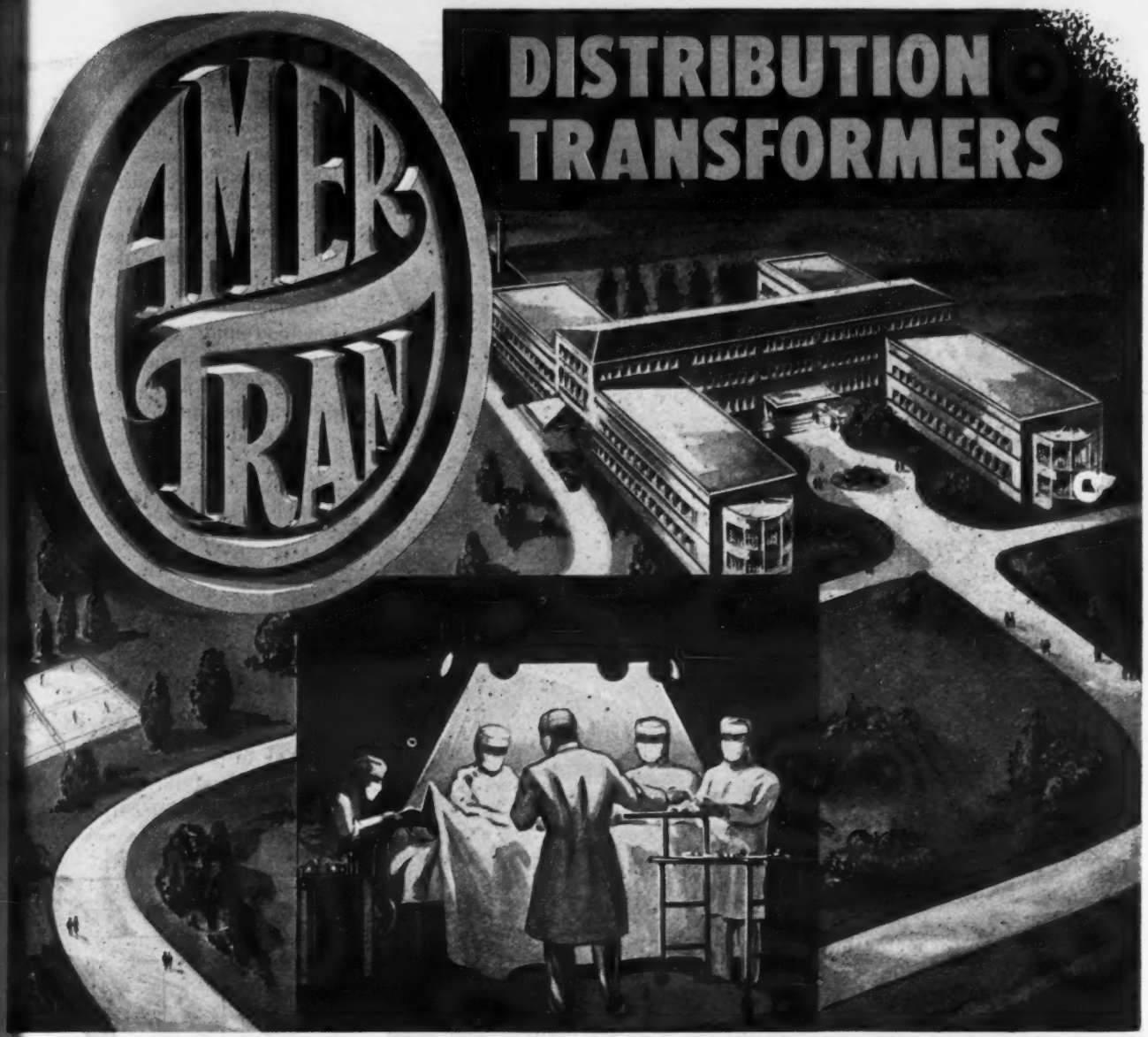
By C. E. BURKE
and H. K. PRITCHARD
*Specialty Transformer Section*
*Fort Wayne (Ind.) Works, General Electric Co.*

In extreme emergencies, sign-lighting transformers can be used to obtain 230-volt, 2-phase, three-wire from 230-volt, 3-phase, three-wire service or vice versa, although the voltage will be unbalanced between 3 and percent. Two transformers can be connected—the main unit connected as an autotransformer for 230 to 20 volts and only the 115/230-volt windings of the other transformers used as the teaser.

When changing from 230-volt 2-phase to 3-phase, the 3-phase voltages obtained will be 237, 237 and 23 When changing from 230-volt 3-phase to 2-phase, the 2-phase voltages will be 221 and 230-volts. Such changes should be considered as a temporary measure since unbalanced voltages might result in considerable overheating of fully loaded induction motors. It is possible that this unbalance in voltages could be tolerated on induction motors which are normally only partially loaded. The rating of the main unit should be at least 2 percent of the total load and the rating of the teaser unit should be at least 10 percent of the total load.

### *Establish A Neutral*

Where it is desired to establish a neutral on 230-volt or 460-volt circuits of not exceeding 50-kva. capacity, three single-phase, standard transformers can be used by zigzag




# For Postwar Institutional Applications

Unfailing dependability and absolute safety have been associated with the AmerTran name for more than forty years. These qualities are prime requirements of electrical equipment for institutional, especially hospital, service. They receive added emphasis in the post-war AmerTran Distribution Transformers. Newly introduced production techniques have increased their inherent ruggedness. Their higher overload capacity, greater protection and coordinated insulation considerably improve the already exceedingly favorable safety margin.

The operating economies introduced by these new AmerTran Distribution Transformers will prove attractive to institutions that must perforce justify expenditures.

**AMERICAN TRANSFORMER COMPANY, 178 Emmet St., Newark 5, N. J.**

**LOOK FOR THESE ADVANTAGES IN THE COMING AMERTRAN DISTRIBUTION TRANSFORMERS**

**Lower Exciting Current**
**Smaller Size . . . Lighter Weight**
**Increased Overload Capacity**
**Improved Tank Construction**
**Coordinated Insulation**
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**New Terminal Facilities**

**AMERTRAN**

MANUFACTURING SINCE 1901 AT NEWARK, N. J.

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

there's a great day coming for TK dealers

Every TK Replacement Unit that you install now wins another loyal friend and enthusiastic booster for you. That's the sure way to build a strong successful business for the years ahead. Quality is guaranteed by the uniformly high standards of T K units nickel – chromium resistance wire in perfect spiral centered in magnesium oxide. Rugged precision construction defies the extremes of heat and cold – rust – corrosion – food chemicals – steam – water and rough handling

Units shown raised to cleaning position. Lift and turn principle makes cleaning easy

THERE ARE ONLY 2 SIZES OF T-K UNITS BUT THERE ARE 18 DIFFERENT INSTALLATION RINGS THAT MAKE THESE UNITS FIT ALL MAKES OF Electric Ranges

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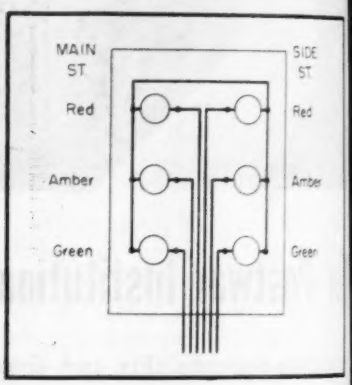
connecting the primary windings w the secondary windings to the lin or by Y-connecting the primary win ings to the lines and connecting t secondary windings in delta, an leaving the delta-connected secondar windings unloaded. The capacity the grounding bank has to be equa to, or greater than, the unbalanced kva. loading and each unit must b large enough to carry one-third of th line-to-ground, short-circuit curren for the length of time it takes the ci cuit protective devices to operate. B limiting the application to circuit whose total 3-phase load does not ex ceed 50 kva. the voltage regulation resulting from single-phase loading should be satisfactory.

Details of the itemized application will be presented in six subsequent issues, with appropriate diagrams o connections.

## Traffic Light Tests Performed Indoors

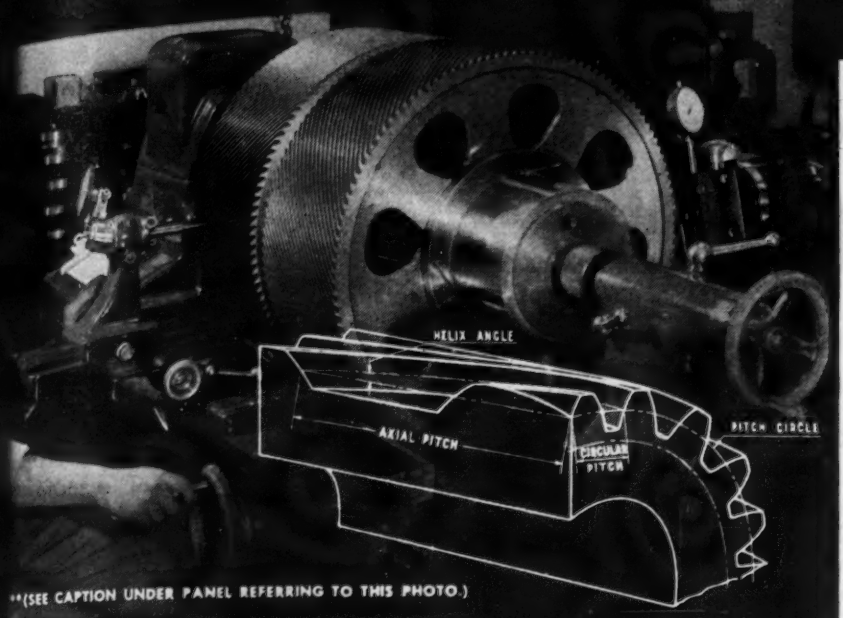
Many of the municipal electric de partments have the responsibility o checking and servicing the communi traffic lights and their controls. Th




**CONNECTIONS** of the traffic-light test board heads attach to time control

timing of these controls in the field has the two disadvantages of tying up traffic and of conducting the test while exposed to the weather.

To overcome these difficulties, Charles Anderson, general foreman of the Lansdale Electric Light Department, Lansdale, Pa., devised the illustrated test board. It is 12 by 18 in. in size and has the necessary 2 red, 2 amber and 2 green bulbs mounted on it. The leads, which are brought out as shown, have clips for connection to the proper terminals on the time control. The board is located in the meter department.




**(SEE CAPTION UNDER PANEL REFERRING TO THIS PHOTO.)

# Studious Inquiry

## at Falk Antedated "Modern Research" by Over 40 Years!

When plastics from resins and magnesium from sea water were only a gleam in the eye of scientists, Falk research was "a going concern."

It was started forty-nine years ago!

Today, more than ever before, Falk is involved in probing structural mysteries through metallurgy and chemical analysis; in tearing apart the "fibers" of metals by mechanical testing; and in delving into the technologies of mechanical power transmission.

All of this studious inquiry was established Falk practice before the phrase "Modern Research" was born!

It is understandable why Falk is a good name in industry.

For by this studious inquiry, Falk has contributed much to the art of its own industry, just as it has to its customers, its community, and its employes, by the maintenance of and adherence to a basically sound, intelligent, and equitable business policy.

It always pays to consult Falk!

## * FALK CONTRIBUTIONS

**1896** ... The first Falk research was initiated 49 years ago in a Chemical Laboratory devoted to the testing of "ingredients of materials" used in the manufacture of Falk products.

**1900** ... Metallurgical research was made a part of the Chemical Laboratory so that "Falk's foundry work included not only its art but also its science."

**1905** ... An old Falk catalog refers to Falk research and describes "our own Chemical and Testing Laboratories which enable us to secure a complete record—microscopic, physical, and chemical—of all material used in our furnaces and of the resultant castings."

**1906** ... Harold S. Falk, now President, graduated from the University of Wisconsin, the first student of that school to major in metallurgy, stimulating further interest in the importance of research in the field of metal-working.

**1910** ... Falk designed and built its own gear hobbing machine in order to manufacture an improved type of herringbone gear which Falk research had proved feasible.

**1927** ... An extensive research program of gear performance and capacities was inaugurated. The findings, later presented in an engineering paper, were subsequently found to possess widespread significance.

**1929** ... The first research program on the Falk All-Steel Flexible Coupling was started, resulting in improved performance and longer life.

**1934** ... The research on gear performance and capacities, started in 1927, was brought to a conclusion and culminated in the Schmitter Rational Gear Formula, now accepted by the industry as the basis for gear design and rating.

**1935** ... Further research on Falk Couplings resulted in a coupling that is unique both from the design and long, trouble-free service standpoint.

**1938** ... Research was carried on which led to the famous Falk Marine Reverse Drive used in army cargo boats, tugs, navy barges, and exclusively in LST's.

**TODAY** ... Gruelling tests in which couplings are being operated under severe misalignment, and gear tests at speed step-ups as high as 30,000 revolutions per minute are now in progress.

** Falk technicians are never satisfied that they have reached the ultimate. Here, in this photograph, the helical lead of a turbine reduction gear is being checked on a lead checking machine.

**THE FALK CORPORATION, MILWAUKEE 8 WISCONSIN**

**For over fifty years precision manufacturers of Speed Reducers ... Motoreducers ... Flexible Couplings ... Herringbone and Single Helical Gears ... Heavy Gear Drives ... Marine Turbine and Diesel Gear Drives and Clutches ... Contract Welding and Machine Work. • District Offices, Representatives, or Distributors in principal cities.**

IT ALWAYS PAYS TO CONSULT **FALK** ... A GOOD NAME IN INDUSTRY

# LOAD SERVICING

Commercial
Industrial

Residential
Rural

## Power Factor Tables Facilitate Billing

To remove the need for calculation of power factor, kva., and other billing quantities in making up bills of industrial customers, there has been provided in the accounting department of the Louisiana Power & Light Co. sets of tables from which figures for bills are taken directly. These tables were suggested by the practice of the Toledo Edison Co., described in the article, "Mechanical Billing Brain," page 102, ELECTRICAL WORLD, April 1, 1944, and were worked up by W. C. Montgomery of Louisiana Power & Light's rate and research department.

There are three tables, one which reads directly in power factor, another for billing demands corrected up to 85 percent power factor, and the third for billing demands adjusted to 80 percent of the kva. These tables are designed to work with demand meters which read in whole points 1 to 100 when the meter constants are the same for the kw. and the rkva. meter. Thus the meter constants are omitted from the table calculations and used after the corrected value is obtained from the table.

When using these tables the power factor billing procedure is simplified by elimination of the usual tangent-cosine interpolation from trigonometric tables as shown by the following example of billing a power factor customer. Note the accompanying illustration which shows a typical page. The kw. meter reading is 47, and the rkva. meter reading is 43, and both meter constants are 4.72. Refer to the 80 percent kva. table 46-50, and under the kilowatt column 47 opposite 43 rkva. find 50962. Point off 3 places, 50.962, multiply by the meter constant, 4.72, and the billing demand at 80 percent of the kva. is 240.5. The power factor table reads directly in percent power factor when 3 places are pointed off and the meter constants are not used.

For convenience in use, the tables along with the instructions are compiled in form for reproduction on standard sized sheets which are bound in a book of about 60 pages. These tables provide a simple direct reading which saves considerable time in billing the power factor feature and, moreover, the accuracy is perfect—an absolute necessity in billing.

80% OF THE KVA. (POINT OFF 3 PLACES) 46 - 50

| RKVA | KILOWATTS 46 | 47 | 48 | 49 | 50 | RKVA | KILOWATTS 46 | 47 | 48 | 49 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 36809 | 37609 | 38408 | 39208 | 40008 | 51 | 54944 | 55483 | 56029 | 56580 | 57137 |
| 2 | 36835 | 37634 | 38433 | 39233 | 40032 | 52 | 55541 | 56074 | 56614 | 57160 | 57711 |
| 3 | 36878 | 37676 | 38475 | 39273 | 40072 | 53 | 56143 | 56670 | 57204 | 57744 | 58290 |
| 4 | 36939 | 37736 | 38533 | 39331 | 40128 | 54 | 56749 | 57271 | 57800 | 58334 | 58875 |
| 5 | 37017 | 37812 | 38608 | 39404 | 40199 | 55 | 57360 | 57877 | 58400 | 58929 | 59465 |
| 6 | 37112 | 37905 | 38699 | 39493 | 40287 | 56 | 57976 | 58488 | 59005 | 59529 | 60058 |
| 7 | 37224 | 38015 | 38806 | 39598 | 40390 | 57 | 58597 | 59103 | 59614 | 60133 | 60658 |
| 39 | 48246 | 48859 | 49478 | 50100 | 50729 | 89 | 80148 | 80519 | 80895 | 81277 | 81666 |
| 40 | 48767 | 49374 | 49986 | 50603 | 51225 | 90 | 80860 | 81227 | 81600 | 81979 | 82366 |
| 41 | 49296 | 49896 | 50502 | 51113 | 51729 | 91 | 81573 | 81937 | 82306 | 82683 | 83065 |
| 42 | 49832 | 50425 | 51024 | 51629 | 52240 | 92 | 82288 | 82648 | 83014 | 83388 | 83768 |
| 43 | 50374 | 50962 | 51555 | 52154 | 52758 | 93 | 83004 | 83361 | 83726 | 84095 | 84472 |
| 44 | 50924 | 51505 | 52093 | 52685 | 53283 | 94 | 83722 | 84077 | 84436 | 84804 | 85177 |
| 45 | 50481 | 52055 | 52636 | 53223 | 53815 | 95 | 84440 | 84794 | 85150 | 85515 | 85883 |
| 46 | 52043 | 52612 | 53186 | 53767 | 54353 | 96 | 85162 | 85511 | 85866 | 86226 | 86593 |
| 47 | 52612 | 53174 | 53743 | 54318 | 54898 | 97 | 85883 | 86231 | 86582 | 86939 | 87302 |
| 48 | 53186 | 53743 | 54306 | 54874 | 55449 | 98 | 86607 | 86950 | 87299 | 87655 | 88015 |
| 49 | 53767 | 54317 | 54874 | 55437 | 56006 | 99 | 87332 | 87672 | 88019 | 88370 | 88727 |
| 50 | 54343 | 54898 | 55449 | 56006 | 56568 | 100 | 88057 | 88396 | 88739 | 89087 | 89443 |
| RKVA | 46 | 47 | 48 | 49 | 50 | RKVA | 46 | 47 | 48 | 49 | 50 |
| | KILOWATTS | | | | | | KILOWATTS | | | | 46 - 50 |

TYPICAL PAGE from power factor billing table

## Food Thawing with High Frequency Heat

Savings in time and reduction of spoilage in the use of frozen foods in commercial bakeries, and improvement of product as well, are promised from experiments in thawing out these foods with high frequency heating. The experiments, in progress now for about six months, are being carried on jointly by the national bakery division of the A & P Food Stores and the electronics division of the Federal Telephone and Radio Corp.

A recent test made by Dr. William Cathcart, head of the food chain's bakery laboratories, resulted in successful quick-thawing of fully ripened peaches, which are among the most highly perishable foods. Thirty-pound cartons of the fruit, solidly frozen and normally requiring 20 hr. to defrost safely, were thawed in less than 15 min. with the aid of the "Megatherm" high frequency process.

### *Fruit, Berries, Eggs*

Defrosting by electronic means is achieved so rapidly, Dr. Cathcart said, that there is no chemical breakdown in the structure of the food such as occurs under normal thawing procedure. Thus, it is possible to retain the firmness and texture of tree-matured fruits and vine-fresh berries.

Dr. Cathcart expressed satisfaction with other recent experiments in defrosting frozen eggs. Storage of frozen eggs requires considerable space in large-scale bakery operations, and additional room is necessarily tied up by the tedious defrosting process. The new method, he said, will save thousands of hours of waiting time annually at A & P bakeries as frozen eggs and other ingredients move through quick defrosters into dough and batter mixers.

"Dielectric or high-frequency heat represents the newest and most powerful weapon against waste and spoilage which characterize the old thawing methods," he said. "Aside from

# Your community's interests may lie in this direction

**Civic officials all over America are interested in ideas for presenting their home town boys with a memorial.**

**Yet, this time they prefer one that is practical, and one that is a sentinel for saving lives. These officials and leaders of civic groups should be given complete information on the benefits of good stret lighting. For more information send to Westinghouse Electric Corporation. P.O. Box 868, Pittsburgh 30, Pa.** J-04027

World War I memorial.

## Make Your Memorial Shout "FREEDOM"!

In your hands is the goal every GI is fighting for—his own home town! He wants it as he remembers it, yet progressive and improved.

You can give it to him that way, in a memorial that honors him and benefits the loved ones he fought for—in a Public Safety Lighting System. This memorial will honor him 365 days a year, and it will help his family and friends in a way he would want. It will help to free them from crime, burglaries, robberies, traffic disasters. It will be a big step toward the fuller life he seeks for them.

This memorial is one which will live as the mark of a good administration, which wipes out the darkness to control delinquency and disorder.

Many civic officials are studying this project with the help of Westinghouse street lighting engineers, who have lifetimes of experience in this work. These engineers bring information from other municipalities, which shows the need and pictures the results.

Good public safety lighting is fully described in a new book which contains facts helpful to civic leaders. Ask your electric power company for your free copy of "Target for Tonight" or write to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-04030

For World War II—A Public Safety Lighting System will memorialize better living . . . safety for the individual . . . the end of brutalities that flourish in the darkness. It will symbolize an enlightened world, an end to blackouts forever.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

*Public Safety Lighting*

This advertisement appeared in American City for April, 1945.

# DELTABESTON
## Asbestos-insulated Cables
## DON'T BAKE OUT

**If excessive heat is causing frequent failures in the electrical circuits of your power plant, it's time to rewire with Deltabeston Asbestos-insulated Cables. Deltabeston is used extensively for general power wiring, lighting and control circuits. Power engineers can't afford to speculate with ordinary cables particularly in places where heat is the essential problem. They rely on Deltabeston because they know from experience that despite extremely high ambient temperature, these asbestos-insulated cables don't bake out.**

**General Electric manufactures a complete line of Deltabeston Asbestos-insulated Wires and Cables for installations where severe operating conditions prevail. There's a cable to meet your most exacting requirements. Here are only a few of the many types.**



**Deltabeston Power Cable Types AVA** for general wiring in power plants, boiler rooms, furnaces and in other torrid zones where constant high temperatures prevail. Insulated with felted asbestos, varnished cambric insert, and asbestos braid or lead sheath.



**Deltabeston Boiler Room Wire Type AVA** for wiring in boiler rooms, central stations, steel mills and other "hot spots". Insulated with felted asbestos, varnished cambric and asbestos braid.



**Deltabeston Apparatus or Motor Lead Wire Type AVA** for wiring apparatus in power plants, steel mills, boiler rooms, etc., where flexibility at high heat is desired. Insulated with felted asbestos, varnished cambric and asbestos braid.

**For additional information write to Section Y552-9-56, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn. Deltabeston Cables are distributed nationally by Graybar Electric Co., G-E Supply Corp., and other G-E Merchandise Distributors.**

***BUY WAR BONDS AND HOLD THEM***

**GENERAL ELECTRIC**


cutting time and space outlays, ... new force prevents decomposition ... discoloration which often occur ... frozen foods are defrosted in wate... at room temperatures."

Different foods require diffe... amounts of thawing time, he point... out. The quantity of a food being ... frosted also affects the timing. ... example, a barrel of frozen ber... intended for baking or process... must now stand in room temperatu... for seven days before it can ... emptied into the cooker. Even th... the heart of the barrel-load may ... be frozen if many cold barrels ... kept close enough to insulate ea... other. The dielectric oven will ... down the thawing time for such qu... tities of berries to one hour, with le... defrosting throughout the barrel. ... precise time schedules are worked ... for various foods, the likely technig... said Dr. Cathcart, will be to place ... tons or barrels on conveyor be... which will pass through the thaw... at a speed to be determined by t... type of food being defrosted.

•

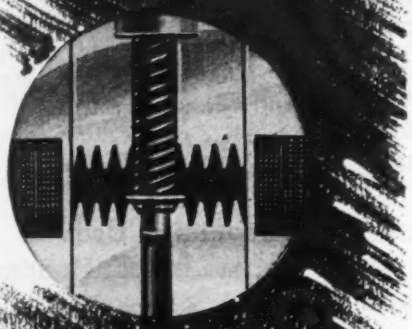
## Utility Plans Limited Merchandising Policy

In anticipation of the release ... certain electrical appliances for civi... ian use, in the months ahead, Th... Empire District Electric Co., Joplin... Mo., recently announced that, afte... the war, it will confine its direct ... merchandising activities to those ap... pliances such as electric ranges, wate... heaters, food freezers, air conditio... ing units, commercial refrigeration ... and attic fans, which require tech... nical or specialized knowledge in ... their sale and installation. In this ... class also fall appliances whose bene... fits are not widely appreciated, es... pecially those that have only recently ... been perfected, or new ones yet unan... nounced, that will require an aggres... sive promotional, educational, and ... sales program to bring about general ... usage.

### *Stimulate Sales*

While the company will continue ... to stimulate the sale and use of every ... type of electrical appliance that, in ... its opinion, will give convenience, ... comfort or profit to its user, it does ... not plan to sell domestic refrigera... tors, radios, washing machines, ... sweepers or other items which al...

# PERSONS SOLENOIDS ARE *Quick* ON THE TRIGGER

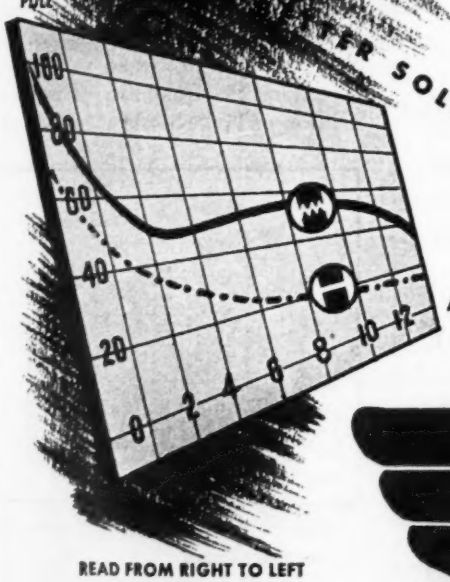


## NEW "TOOTH" CONSTRUCTION RESULTS IN GREATER STARTING POWER

(U.S. Patent Pending)

Solenoids—like gun triggers—require greatest pull at the start. But ordinary solenoids develop it at the end. Not so Persons'. Their "teeth" on plug and plunger reduce the air gap and its inertia so that a given job can be done by a lighter, more compact solenoid—with peak pull at the start.

Many models AVAILABLE IMMEDIATELY. Send for our bulletin.

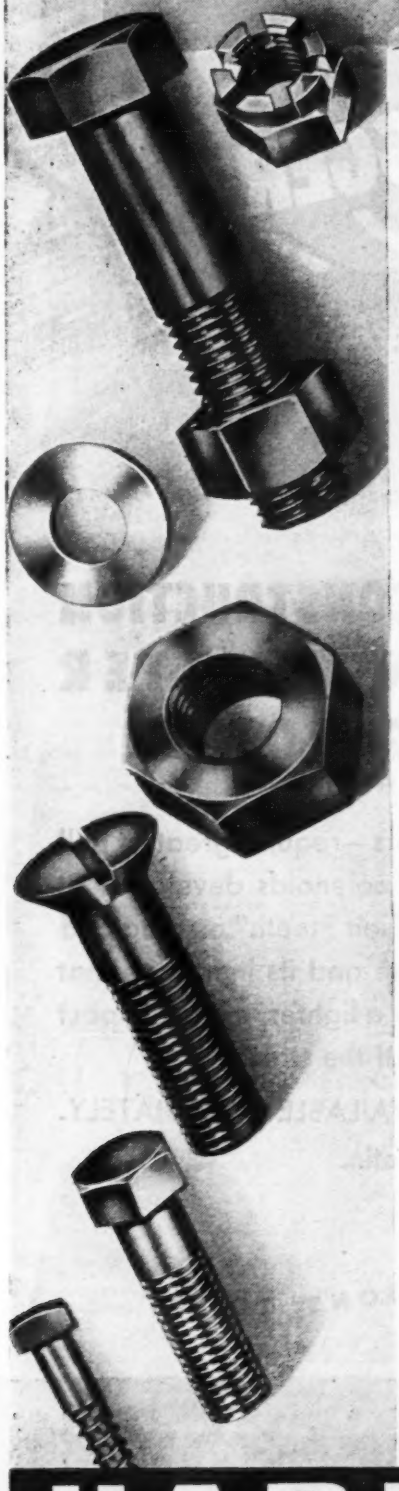



PERSONS SOLENOIDS WE ARE THE "PERSONS" TO SEE

LMP

6309 MANCHESTER AVE. • ST. LOUIS 10, MO.

# DEFY CORROSION
## *at small cost*



### BUILD YOUR PRODUCT WITH EVERLASTING FASTENINGS

Your product must stand up in use. In many cases it will meet the destructive forces of rust and corrosion.

Forestall trouble! Use Harper Everlasting Fastenings. They're made of either brass, naval bronze, silicon bronze, copper, Monel or stainless steel. They defy rust and corrosion . . . and *do it at small cost.*

To be sure . . . a bronze bolt costs more than a common steel one . . . but not much more. In most instances, constructing a machine or an instrument with non-ferrous or stainless fastenings adds only pennies to the total cost. Percentage wise, the added expenditure is negligible. But the life of the product . . . the ability to "take it" . . . the probability of freedom from trouble are increased beyond measure.

**4360 ITEMS IN STOCK**

Harper is known as "Headquarters for Non-Ferrous and Stainless Fastenings" . . . carries large and complete stocks of 4360 different items and is continually adding others. Write for 1945 Catalog.

**THE H. M. HARPER COMPANY**

2611 Fletcher Street, Chicago 18, Illinois

BRANCH OFFICES: New York City • Philadelphia Los Angeles • Milwaukee • Cincinnati • Houston

*Representatives in Principal Cities*

**HARPER**

EVERLASTING FASTENINGS

BRASS • BRONZES • COPPER • MONEL • STAINLESS


ready have wide usage. However, a quality line of small table appliances, light bulbs, lamps, etc., will be available in all company offices for the convenience of customers.

Wherever practical, the Joplin company will not retain exclusive agencies on the appliance it sells, thus giving customers the opportunity to purchase their favorite make of appliances wherever they choose.

For the benefit of both electric customers and local dealers, when they request, Empire will continue to maintain a specially-trained appliance service organization to repair at reasonable cost all types and brands of electrical appliances wherever purchased, limited only by its ability to obtain repair parts from the various manufacturers.

The announcement stated that the utility will cooperate with all dealers in the communities it serves, through advertising, demonstration, display and other cooperative programs. An engineering staff will be maintained to aid dealers and customers in the design, layout and application of electric lighting and power installations.

•

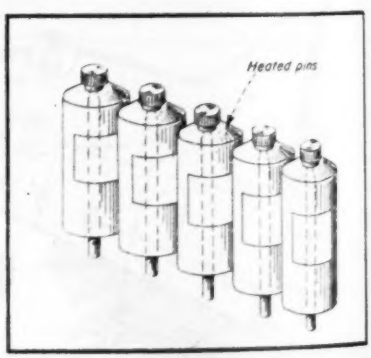
## Uncommon Uses for H. F. Heating—IV*


By E. D. TILLSON

*Testing Engineer*

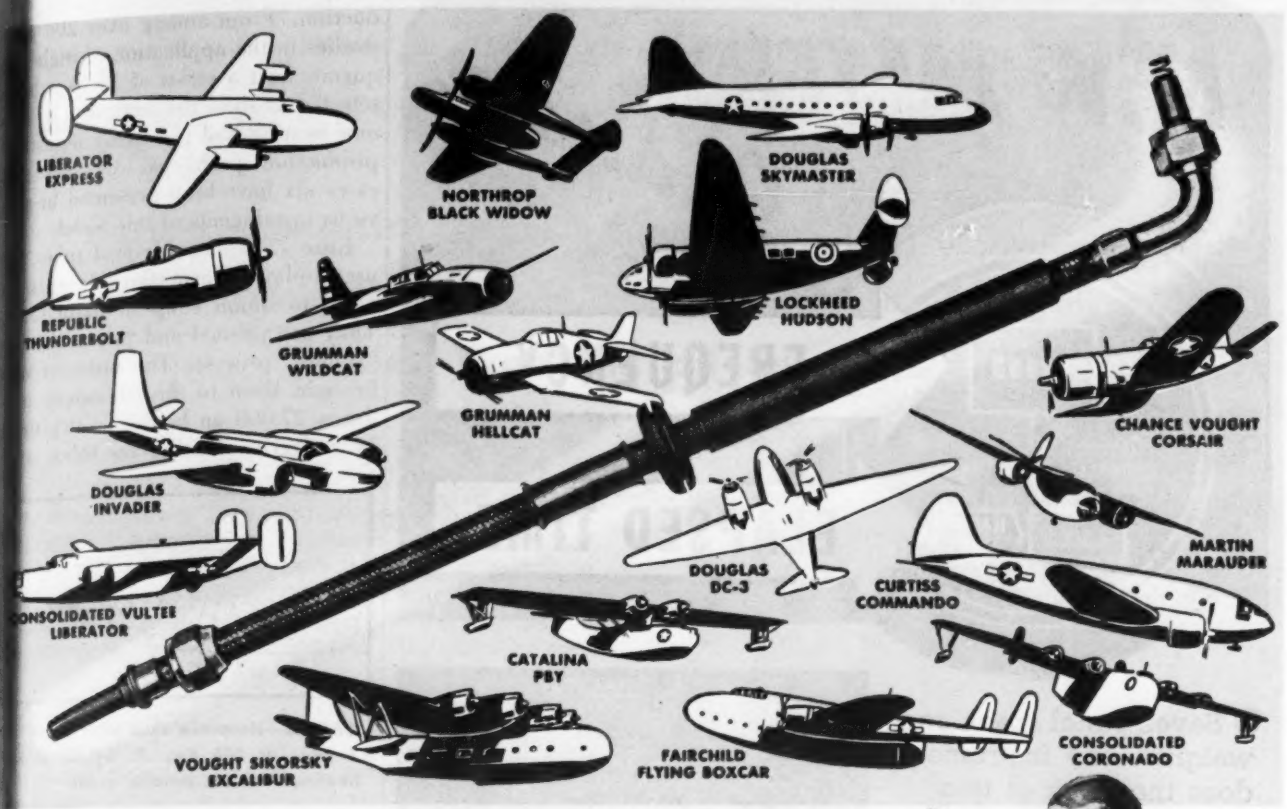
*Commonwealth Edison Co., Chicago, Ill.*


Among the services rendered to industrial customers by Commonwealth Edison is the running of tests on processed or semi-processed materials to determine the feasibility of using induction or dielectric heat in their pro-




CASE 7—Dry paint on lead tubes by induction heating

* Based on paper presented by the author before "High Frequency Heating Conference" sponsored by Great Lakes Power Club and Chicago Lighting Institute.




# "We're Adaptable – We Like Tough Problems," says Romey

Early in 1942 Titeflex Inc., of Newark, N. J., asked Rome Cable engineers to develop, along with its Newark laboratory, the UNIMOLD AIRCRAFT IGNITION LEAD, although this development was divorced from Rome's customary products—copper wires and cables.

Thus was designed and perfected an integrally molded lead that provided quicker starting, longer life, fewer repairs and safer flights for our nation's warplanes, through improvement of the nerve center of the plane—namely, the ignition system. All types of planes shown above use UNIMOLD.

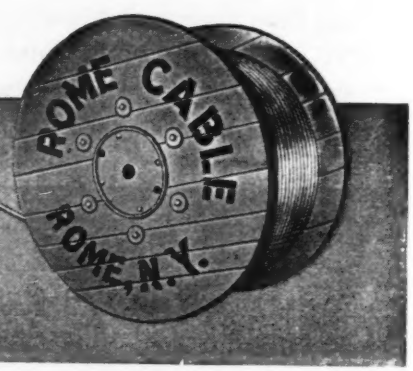
What Rome Cable did for one customer—Titeflex—and our country in wartime, we can do for other customers in peacetime. We welcome both your problems and inquiries.

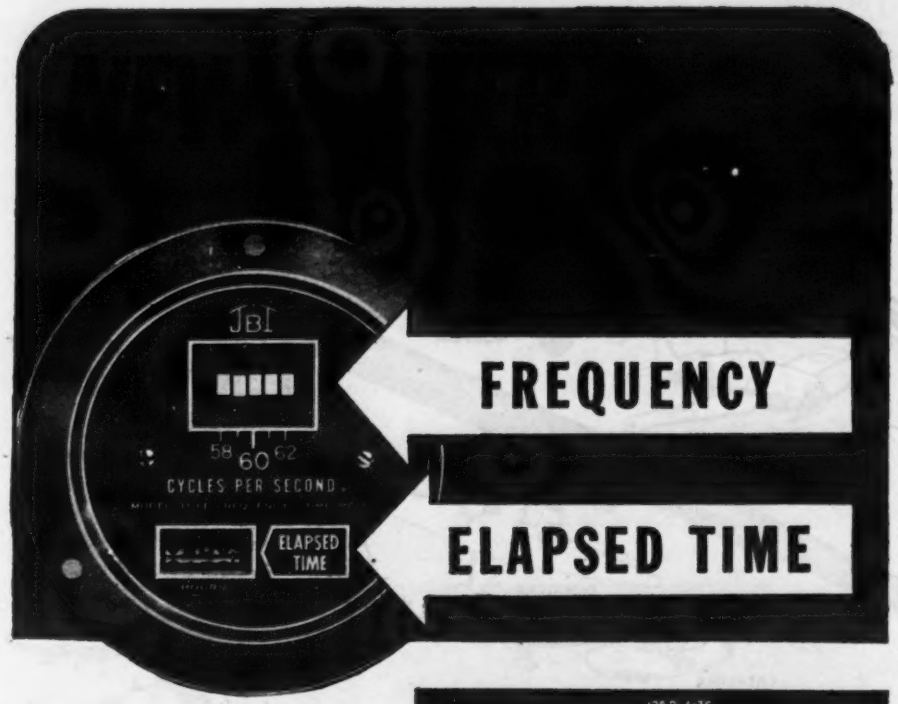
"Those planes overhead are safer because of UNIMOLD ... produced by Rome Cable which didn't say 'No' to a new problem that involved making a product outside our regular line of business"... says Romey.

FROM BAR TO FINISHED WIRE

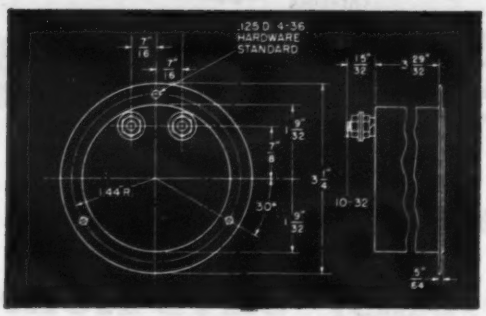
ROME CABLE CORPORATION

ROME • NEW YORK






- Saves panel space and weight – one instrument does the work of two
- Insures operation of equipment at proper speed, within ± 0.3%
- Eliminates breakdowns caused by failure to lubricate, maintain and overhaul—on schedule




Size...3¼" flange diameter. Black metal case for flush-panel mounting. 5 reeds...58-62 cycle range. Accuracy... ± 0.3%. Power consumption...3 watts, 110 volt operation. Weight...1.3 lbs. Also made for 59-61, 48-52, and 49-51 cycle ranges.

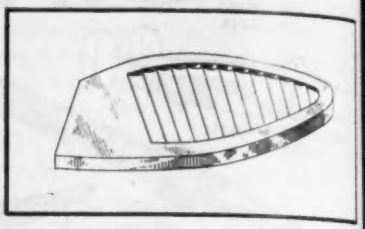
This combination running time and frequency meter is just one of the variations J-B-T has pioneered for specific field and laboratory use in measuring speed, temperature and frequency. This and 17 other interesting applications are illustrated in a new bulletin, now ready.

They may suggest ways to attack your own problems...through use of J-B-T's wide engineering "know how," laboratory set-up and production capacity. Ask for Bulletin VF 43-IC.

**P.S.** Perhaps you would also like to have Bulletins VF-43 describing basic Vibrating Reed Frequency Meters and their operation, VF 43-IA on 400 cycle meters and VF 43-IB on the smallest frequency meters made. They're yours for the asking too.

duction. From among over 200 case studies in the application of high frequency heat a series of 14 have been selected to show the flexibility of this new heating tool in solving industrial production problems. Of these 14 cases six have been presented in previous installments of this series.

*Case 7.* Collapsible lead tubes are used today for everything from tooth paste to onion soup in paste form. They are painted and printed by the "roll-on" process. The customer who brought them to the laboratory produces 27,000 an hour. To dry them by induction heating the tubes were



**CASE 8—Neoprene shoe soles cured in 2 min. at 200 deg. F. by dielectric heating; use non-metallic molds**

placed over a series of rods and heated. Tubes are open at the bottom and the paint on the outside is dried by heat dissipated from the steel rod on the inside. The drying time is 2 minutes with the rod heated to 400 deg. F. Convection oven heating, the alternate process, required 20 minutes for the base coat and 20 minutes for the overprint.

*Case 8.* No-skid neoprene shoe soles have been polymerized under 100 psi. using dielectric heat. But to do this a plate facing must be used to which the neoprene will not stick. In this case the sample was polymerized in two minutes at 200 deg. F. Incidentally, all curing operations that have been carried out with steel or aluminum alloy molds, in the past, will have to be done in non-metallic molds if dielectric heating is to be used. The molds will be made of micalex, mykroy or some such material. Of course the virtue of high-frequency heating is the same, that is, the material is cured throughout the mass in a very short time without over-curing the outer portions.

•

## A Golden Bombardment

Million-volt X-ray units bombard malignant cells with radiation equal to $95,000,000 worth of radium.

# Improved System Stability

## during short-circuit or overload with 5-cycle opening of the new Multiflow "De-ion" Grid in the reduced size Type GM oil breakers

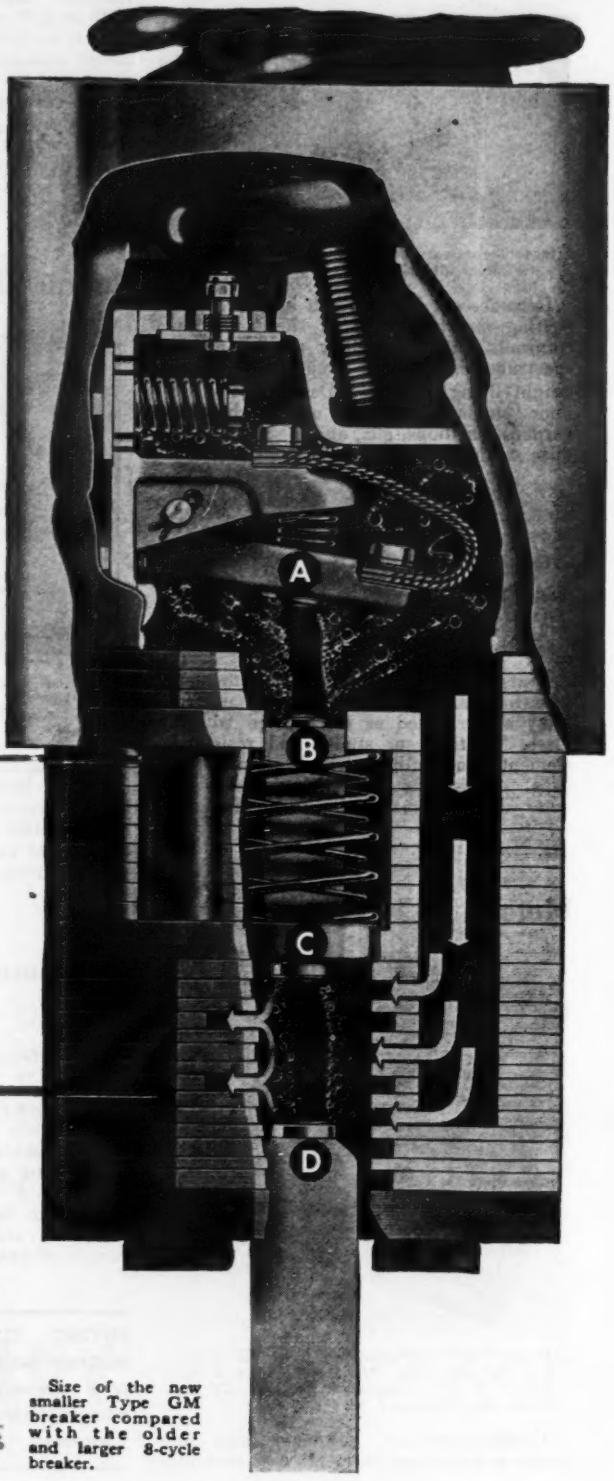
In Westinghouse Type GM oil circuit breakers, the Multiflow "De-ion" action makes possible a new high level performance in a standard line of breakers to again improve stability of power transmission systems.

The Multiflow Grid, another exclusive Westinghouse development, is simple in action. Two pairs of contacts open in quick succession, drawing two arcs in series. The first arc generates gas and produces oil pressure which forces oil through the second arc, and sweeps arc products out of the vents for speedy deionization. Opening is fast—5 cycles—extinction of arc almost instantaneous.

Smaller in size, but with same safety factor, these new breakers require less oil and less oil handling, and smaller foundations compared with older standard 8-cycle breakers. Reduced arc energy means longer oil life—less wear on contacts. Access to grids and contacts is easy—saving maintenance time.

Ratings range from 115 to 230 kv, with interrupting capacity up to 3,500,000 kva.

Get complete information from your Westinghouse office or write for B-3424, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60603




### MULTIFLOW WORKS LIKE THIS...

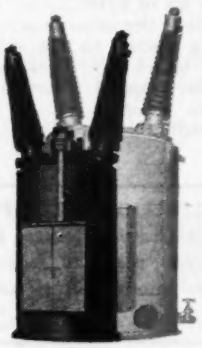
Contacts A and B part first, immediately followed by contacts C and D. Upper arc creates oil pressure, forcing oil through channel indicated by arrows down to compartment containing lower arc. This sweeps arc products out of the vents and produces an extremely high rate of deionization at current zero.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

TYPE GM

*Circuit Breakers*



Size of the new smaller Type GM breaker compared with the older and larger 8-cycle breaker.

# NEW EQUIPMENT

## Insect Repellent Lamp

Insect repellant lamp: 120-volt; 60 and 100-watt. **Solar Electric Corp.**, Warren, Pa.

Incandescent lamp, which has a ceramic coating on the inside of the bulb that transmits only the yellow portion of the spectrum, is said to repel phototropic (night flying) insects. Designed for outdoor summer lighting on porches, in gardens, pavilions, etc., and is said to minimize night-flying insect nuisance.

•

## Sealed Resistors

No. 1100 series hermetically sealed wire-wound resistors: resistances from 1 000 ohms to 10 megohms. **Shallcross Mfg. Co.**, Collingdale, Pa.

Units are said to be impervious to moisture, fungus, vibration and rough handling. They are reported as constructed without glass, "floating" or stud-locked resistance elements, and without ferrule terminals or caps. Resistance winding element and outer shell are made of ceramic material.

•

## Meter

Model "601" volt-ammeter: 0 to 500 amp.; 0 to 600 volts; case 12½ in. x 9½ in. x 10 in.; weight 25 lb. **Associated Research**, 231 S. Green St., Chicago 7, Ill.

Combination a.c. voltmeter and ammeter is contained in metal case and provides simultaneous voltage and current readings. Ammeter has eight ranges—0 to 1, 0 to 5, 0 to 10, 0 to 25, 0 to 50, 0 to 100, 0 to 250 and 0 to 500 amp.; voltmeter measures from 30 to 600 volts in three ranges—150, 300 and 600 volts. Inserted current transformer with 8-ft. secondary leads facilitates current measurements without subjecting meter to stray magnetic fields. Scales have white background, jet black figures and are protected by glass.

•

## Repair Kit

Electrical repair kit with tool and solderless terminals for No. 22 to No. 10 stranded-wire sizes. **Aircraft-Marine Products, Inc.**, Harrisburg, Pa.

Tool supplied with the repair kit has insulated handles of molded plastic and has a corrosion-resistant finish. The tool has facilities for cutting the wire, determining the gauge, stripping the insulation and crimping the copper terminal to the wire.

•

## Tachometer

Model "5-E" tachometer; lower scale 0 to 2,000 r.p.m., upper scale 0 to 6,000 r.p.m.; size 2⅝ x 2⅞ in. x 5 in. **Chicago Electric Tachometer Co.**, 800 N. Clark St., Chicago 10, Ill.

Tachometer has two scales for measuring speeds up to 6,000 r.p.m. Changing from one scale to the other is accomplished by pressing a button on the side of the housing. A wheel for clocking surface speeds can be supplied. Normal machine vibrations are reported not to effect accuracy of readings.

**BUYING ELECTRICAL EQUIPMENT?—*McGraw-Hill's Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.**

## Printer—Developer

Model 41 printing and developing machine; print width 46 in.; ball bearing motors; caster mounted. **Charles Bruning Co., Inc.**, 4754 Montrose Ave., Chicago 41, Ill.

Model combines individual printing and developing units in single cabinet. Printer said to have a speed range up to 6 ft. per min. and uses either roll stock or cut sheets. Light source is a 2,000-watt mercury vapor lamp within a 6-in. diameter cylinder. Air for cooling is drawn in from machine front. Suction through bands is said to simplify feeding of tracings and sensitized papers and tangential method of feeding is said to assure safety to the tracings and to eliminate pinching or catching.

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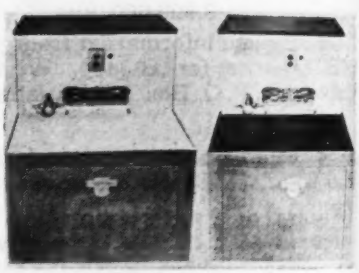
## Induction Heating Table



Single-position, general-purpose work table. **Induction Heating Corp.**, 389 Lafayette St., New York 3, N. Y.

Work table includes a sink for use in spray quenching operations and a removable Transite cover which can be used as a working area when necessary. Piping provisions, solenoid operated valve and quench flow regulator for controlling the timing and volume of the quench are incorporated in the table.

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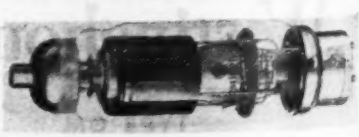
## Power Control Tube



WL-678 Thyratron power control tube; 15,000 volt. **Westinghouse Electric Corp., Lamp Division**, Bloomfield, N. J.

Power control tube is said to provide split-cycle control of high power for r.f. heating units and radio transmitters. It is

# HUBBARD AUTOGAP FUSE CUTOUT

NO. 2315

HUBBARD AUTOGAP FUSE CUTOUT is a combination of No. 2302, 9 KV Autogap Lightning Arrester with a new, improved 7-1/2 KV open type fuse cutout. The assembly is Stock No. 2315.

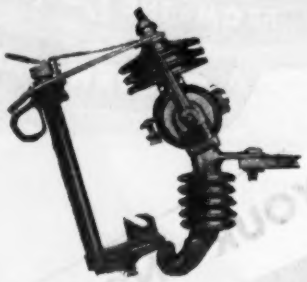
VOLTAGE, phase to ground is recommended to be limited to 7500 Volts.

FUSE rating is 50 Amperes. Fuse links are not furnished. Any standard can be used.

INTERRUPTING CAPACITY of the Hubbard Autogap Fuse Cutout is 1200 Amperes.

MOUNTING Brackets are available. No. 2323 for Crossarm and No. 2325 for pole. Specify type of mounting when ordering.

WEIGHT of the assembly is 18 Pounds each, packed for shipment.



**CLOSED POSITION:** The flat, phosphor bronze spring at the top is in tension, ready to kick out the mechanism instantly when the blowing of the fuse releases the tension.

**OPERATING:** This view shows the action during transition from "closed" to "open" positions. The fuse has blown and the toggle mechanism is forced open by the top contact spring. The gap caused by the blown fuse is instantly lengthened to at least 3-inches by the leverage of the toggle mechanism, causing the arc to be extinguished within the fibre fuse tube rather than at the top contacts, where burning might occur.

**OPEN POSITION:** Top contact spring is relaxed, having exerted its pressure toward opening the mechanism. Tube drops to hanging, open position which places the notch for "hot-stick" removal of fuse tube in an accessible spot

## HUBBARD AND COMPANY

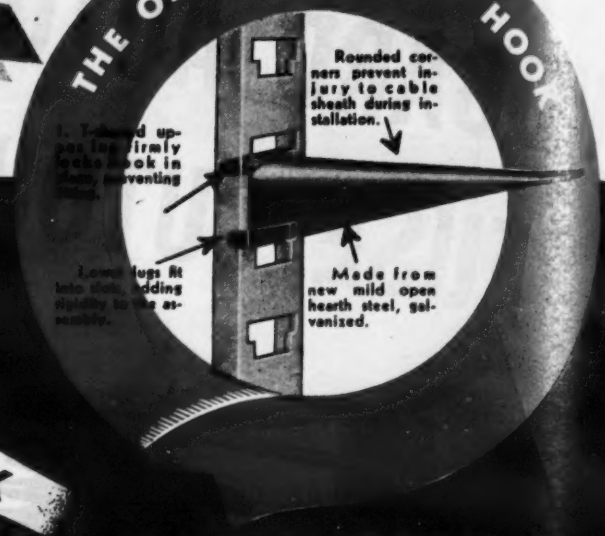
PITTSBURGH · CHICAGO · OAKLAND, CALIF.

FROM THE *Complete* LINE OF

**OLIVER** POLE LINE MATERIALS

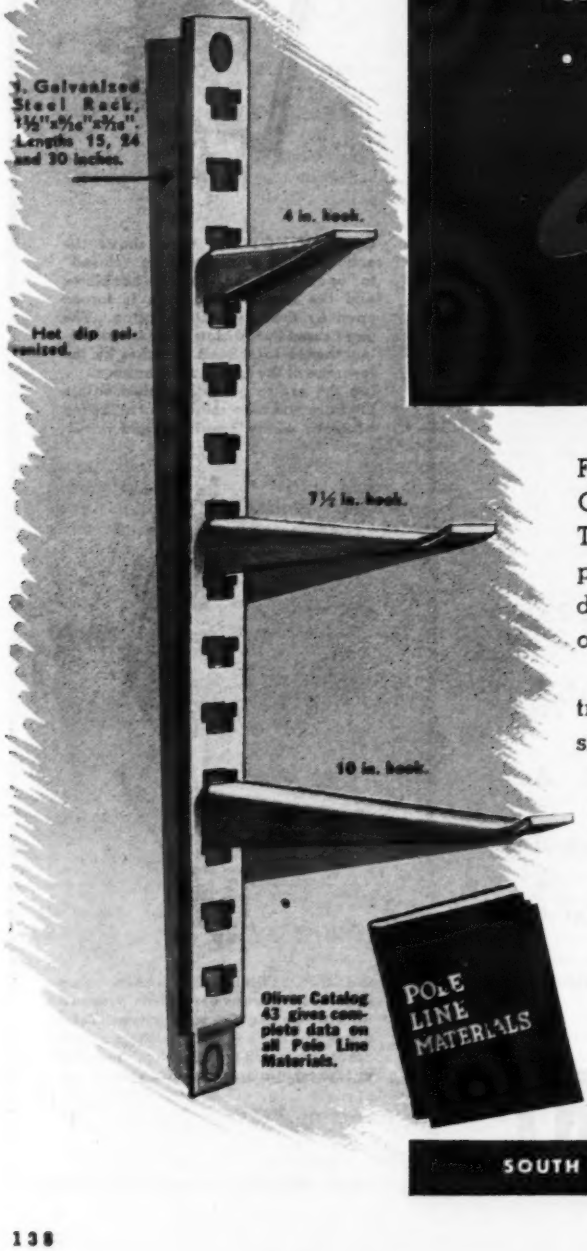
# YOUR UNDERGROUND WORK

## THE OLIVER PRESSED HOOK




## INSTALLED MORE EASILY...
## ...COMPACTLY...with

# OLIVER CABLE RACKS


1. Galvanized Steel Rack, 1½"x⅝"x⅛". Lengths 15, 24 and 30 inches.
4 in. hook.
Hot dip galvanized.
7½ in. hook.
10 in. hook.
Oliver Catalog 43 gives complete data on all Pole Line Materials.
POLE LINE MATERIALS

For underground or interior installations of cable, Oliver Cable Racks provide neat, compact, permanent supports. The size of racks and hooks can be selected to suit your present or future requirements. Special features of Oliver design—based upon extensive experience—assure ease of installation and satisfactory performance.

In addition to the channel shaped pressed hook illustrated, the Oliver T-section Hook is available in the same sizes. Other Oliver Underground materials include: Heavy Duty Racks, Cable Rack Insulators, Anchor Bolts, Duct Shields, Ladders and Manhole Steps, Pulling-in Irons, Dowel Pins.

MAKERS OF POLE LINE MATERIALS SINCE 1894

**OLIVER**
IRON AND STEEL
CORPORATION

SOUTH TENTH AND MURIEL STREETS, · · PITTSBURGH 3, PA.

ld to provide smooth power control from ro to 100 percent load and high speed utomatic overload protection. Following ata applies to the tube:

| General Characteristics | Max. Temp. of Mercury 55 deg. C. | 50 deg. C. |
|---|---|---|
| Filament voltage | 5.0 | 5.0 |
| Filament amp. | 7.5 | 7.5 |
| Min. filament heating time | 1 min. | 1 min. |
| Typical control bias at rated voltage | −50 volts | −75 volts |
| Maximum Ratings | | |
| Anode voltage, peak forward | 10,000 | 10,000 |
| Anode voltage, peak inverse | 10,000 | 10,000 |
| Anode current, amp. average | 1.6 | 1.6 |
| Anode current, amp. peak | 6 | 6 |
| Temp. range, condensed mercury | 25 to 55 deg. C. | 25 to 50 deg. C. |

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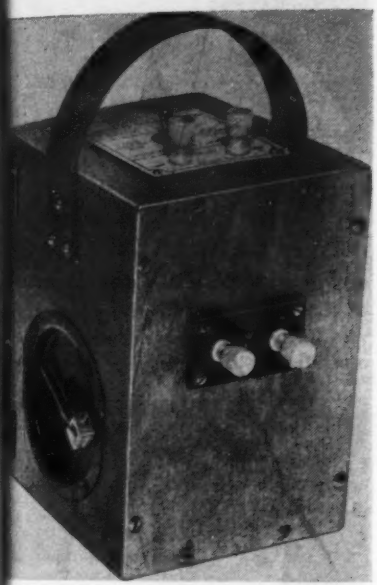
## Circuit Tester



Circuit tester for residential and commercial wiring: Connecticut Telephone & Electric Division, Great American Industries, Inc., Meriden, Conn.

Unit is used to test for short, open or grounded circuits. It contains a hand operated generator which develops 500 volts d.c. so regulated that uniform voltage is maintained regardless of crank speed. It is stated that, with this instrument and a special indicator attachment, the polarity can be determined, visually.

•

## Motor Starter

Type "LZS-HR" motor starter: 50 hp. at 220 volts and 100 hp. at 440 or 550 volts; rupturing capacity 10,000 amps. Electric Controller & Mfg. Co., Cleveland 4, Ohio

Motor starter has 3-pole heavy duty oil-immersed contactor, adjustable magnetic overload relay in each line of the 3-phase circuit, and a disconnect switch with an externally operated handle. Unit is designed for use in dusty or corrosive atmospheres. Separately mounted pushbuttons are available to provide low voltage protection or low voltage release.

# TECHNICAL LITERATURE

**Rectifiers**—Manual on selenium rectifiers is intended primarily for design engineers who utilize d.c. in their products. Principle, properties and construction of selenium rectifiers are explained. Efficiency, regulation, temperature range, voltage and current characteristics, forward and reverse resistance characteristics, ratings at elevated temperatures are all reported in detail by illustrations, tables and curves. Copies of the manual (bulletin RDP-107) are available from Fansteel Metallurgical Corp., Rectifier Division, North Chicago, Ill.

**Welding**—Booklet, "101 Welding Ideas for Low-Cost Maintenance," is obtainable from Lincoln Electric Co., 12,808 Coit Road, Cleveland 1, Ohio. It contains 16 pages of pictures and text on the use of welding in the reclamation of worn parts, repair of broken parts and structures, replacement of worn and broken equipment with welded designs, and construction of special shop equipment and structures.

**Extinguisher Guide**—"Fire Extinguisher Installation Guide" is a gum-edged, 8½ by 20 in. chart for posting over extinguishers to assist employees in determining which extinguisher to use on various types of fires. It divides fires into the "A", "B" and "C" classifications and illustrates typical fires in each classification. Quantities are available without charge from Randolph Laboratories, Inc., 8 East Kinzie St., Chicago 11, Ill.

**Plastics**—"The Story of Plastic Molding" is a 24-page booklet on when and how to use molded plastics. Contains a chart of comparative physical properties of leading plastic molding materials. Copies may be secured from Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.

**Standards**—Second edition of A.S.T.M. Standards on Paper and Paper Products is available from American Society for Testing Materials Headquarters, 260 S. Broad St., Philadelphia 2, Pa. at $1.50 per copy. (Reduced prices on quantity orders.) Contains the specifications, test methods and related standards that have been developed by the technical committees.

**Load Ratio Control**—Voltage regulator information for use on power transformers to change taps without interrupting the load and to keep line voltage at proper level is presented in a bulletin on Load Ratio Control which is obtainable from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Methods of interrupting current under load and equipment use are discussed. Also shows application of load ratio control in auto transformers, main windings, grounded neutral, multiple-winding transformers, and with series transformers, illustrating how each installation is provided with a "tailor-made" circuit.

**FM Radio**—Discussion of the position of FM in the radio spectrum, which took place on January 27, 1945 at a special session of the four-day I.R.E. Winter Technical Meeting, has been transcribed and copies are available for distribution. It contains 30 mimeographed pages, bound in a durable cover, and is available from the Institute of Radio Engineers, 330 West 42nd St., New York 18, N. Y. at $3.00 per copy, postage prepaid.

**Motor Guide**—New motor selector guide is obtainable from the Dunmore Co., Motor Division, Racine, Wis. It provides the design engineer and production executives with a step-by-step method of selecting the type and size of fractional horsepower motor. In addition, it explains many "built-in" controls which are desirable for certain applications.

**Companion Instruments For All Departments**

**Associated Research's**

**VIBROTEST—**

No *handcranking.* No *levelling.* No *shocks.* Accurate easy reading of insulation resistance testing in any position. Every electrical field, every electrical industry, every electrical department dependably served by VIBROTEST with range of 0-200 megohms at 500 volts from self-contained power source. Potential 0-2,000 ohms, 150-300-600 volts DC or AC. Here is reliable CRANKLESS INSULATION RESISTANCE TESTING in its handiest, most modern form.

**VIBROGROUND—**

Simply press button for positive determination of resistance of all ground connections. Protects life and property. Direct reading. No calculations necessary. No reverse readings nor polarization errors. "Strays" excluded. Time saving. Cost saving. Two types—one for average ground conditions, another for extremes of dryness and moisture.

**Prompt deliveries. Send for Engineering Bulletins on these sturdily encased portable and essential units. Write**

ASSOCIATED RESEARCH, Incorporated

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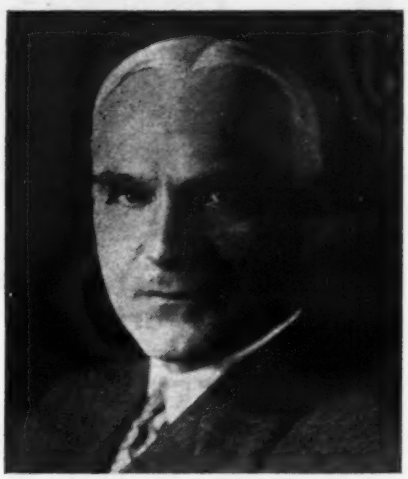
# NEWS ABOUT PEOPLE

## Buffalo Utility Makes Executive Appointments

Directors of Buffalo, Niagara & Eastern Power Corp. have promoted Dr. Norman R. Gibson, vice-president in charge of engineering for the operating companies of the system, to the position of senior vice-president and Edwin S. Bundy, chief electrical engineer for the Western Division companies, to chief engineer and vice-president. Albert T. O'Neill, chief counsel, and Arthur W. Jackson, treasurer, were named vice-presidents. At a subsequent meeting of stockholders of B. N. & E. George J. Brett, comptroller and a director of



N. R. Gibson

Niagara Hudson Power Corp., and John T. Kimball, a vice-president and director of Central New York Power Corp. and of New York Power & Light Corp., Niagara Hudson subsidiaries, were elected directors.

Dr. Gibson has been with the company and its predecessors since 1918, when he became hydraulic engineer for the old Hydraulic Power Co. of Niagara Falls. In 1926 he was named chief engineer for that company's successor, the Niagara Falls Power Co. and in 1929 became chief engineer for B.N.&E. Dr. Gibson is chief engineer of Niagara Hudson System companies, vice-president of Niagara Hudson Power Corp. and president of Canadian Niagara Power Co., Ltd. In 1930 he was awarded the Elliot Cresson gold medal by the Franklin Institute of Pennsylvania for his invention of the Gibson method and apparatus for measuring the flow of liquids in closed conduits, which has been used in major hydroelectric installations in many parts of the world.

Mr. Bundy, who succeeds Dr. Gibson,

E. S. Bundy

as chief engineer started with the Niagara, Lockport & Ontario Power Co. shortly after graduation from Cornell University in 1911, and worked in various capacities in the western and central divisions of the company until 1923 when he was named electrical engineer. In 1932 he became assistant electrical engineer for B. N. & E. and four years later chief electrical engineer. He has also been supervising engineering for the Niagara Hudson System since 1941.

•

▶ W. D. DISHNER, electrical engineer, East Tennessee Light & Power Co., Bristol, Tenn., has resigned to join the Tennessee Eastman Corp. at Kingsport.

▶ C. READ GRANBERRY, for many years a member of the University of Texas engineering faculty, has been named assistant to the president by the Board of Regents. Mr. Granberry is professor of electrical engineering and regional coordinator of engineering extension of the engineering, science and management war training program.

## Lindseth Made President of Cleveland Utility

Elmer L. Lindseth was elected president of the Cleveland Electric Illuminating Co. at a meeting of the board of directors held last week and Dean C. Ober was named executive vice-president.

As president Mr. Lindseth, formerly

E. L. Lindseth

executive vice-president, succeeds the late Eben G. Crawford. Mr. Lindseth was also elected a director and member of the executive committee. Mr. Ober was formerly vice-president in charge of operations. Both Mr. Lindseth and Mr.

D. C. Ober

Ober are graduates of the Case School of Applied Science. Both began work for the Illuminating company while students at Case, and each has spent his entire working life with the company.

•

▶ WILLIAM S. PETERSON has been promoted to the position of assistant chief electrical engineer of the Los Angeles Department of Water and Power. Mr.

# STEEL of every kind delivered QUICKLY from STOCK

*Principal Products*

Bars, shapes, plates, sheets, structurals, mechanical tubing, boiler tubes, carbon and alloy steel, Allegheny stainless tool steel, Inland 4-Way floor plate, Hi-Bond Reinforcing, bolts, rivets, machinery, etc.

For new construction or equipment, for maintenance or repairs on existing units, for any of hundred and one steel requirements . . . depend on Ryerson Steel-Service.

There are large and complete stocks of almost every kind of steel in your nearby Ryerson plant . . . backed by a nation-wide organization of eleven plants, ready to serve you. We'll gladly work with you on any problem involving supply, application or fabrication. Call Ryerson for quick action on steel.

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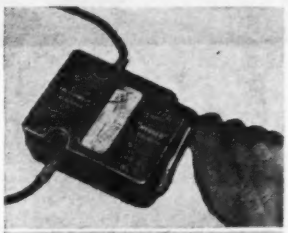
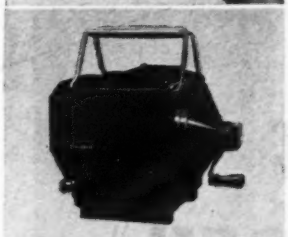
# WHICH "MEGGER" INSULATION TESTER is Best for You?

THE "Megger" line of instruments for testing electrical insulation is complete for ranges from a fraction of an ohm to 10,000 megohms, between which limits practically every insulation resistance measuring requirement falls. There are specific instruments for specific requirements and other types for more general use. Some users find one instrument suitable for all work, while others have use for several types.

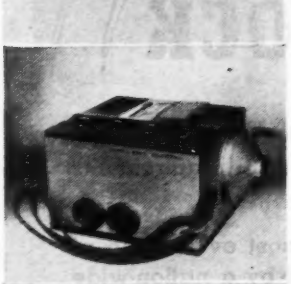
If you are uncertain which type and range of "Megger" instrument is best for your particular needs, write us, telling the type, size and rating of your equipment. We will gladly make recommendations. Write also for *Pocket Manual of "Megger" Practice*, No. 1420-W.



**The New U. S.-Made Midget "Megger" Tester**—*In many ways the most remarkable "Megger" instrument ever built. Weighs only 3 lbs—will fit an overcoat pocket or tool kit. Reads up to 50 megohms. Generates 500 volts and is always ready for use anywhere because of the hand crank. Bulletin 1785-W.*



**The U. S.-Made "Megger" Insulation Tester**—*Contains the usual "Megger" direct-reading true ohmmeter, of the permanent magnet moving coil type, mounted with a d-c hand generator in a plastic molded case. Ranges up to 2000 megohms, with hand generators up to 1000 volts. Widely used in hard service. Variable-pressure ("Meg") and constant-pressure ("Super-Meg") types. Bulletin 1735-W.*



**The "Bridge-Meg" Resistance Tester**—*This instrument is a combined "Megger" Insulation Tester and a four-dial, multi-ratio Wheatstone Bridge. Will measure any ohmic resistance from .01 ohm up to 100 or 200 megohms; hand generators rated up to 1000 volts. A complete and compact unit that is ideal for power companies and industrial plants. Catalog 1685-W.*

**High-Range "Megger" Testing Set**—*The original heavy-duty type "Megger" Testing Instrument. Made in all ratings up to 10,000 megohms and 2500 volts. A combination high-potential testing and insulation resistance measuring set. Hand- and motor-driven types. Catalog 1685-W.*

**JAMES G. BIDDLE CO.** • **1211-13 ARCH STREET PHILADELPHIA 7, PA.**


Peterson will fill the vacancy created by the recent promotion of Charles P. Garman to executive head of the municipal power system (ELECTRICAL WORLD, May 12, page 163). A graduate of the University of California in electrical engineering, Mr. Peterson has been an employee of the Department since 1922. He is widely known for his work in connection with the designing of the three 287,500-volt transmission line circuits from Boulder Dam to Los Angeles.

•

## Executives Take Office Under Local Management

Directors of the now locally operated Empire District Electric Co., Joplin, Mo., formerly a Cities Service subsidiary, have elected James E. Harsh as chairman of the board. Mr. Harsh continues as president of the company, a position that he has held for many years.

J. E. Harsh

In accepting his chairmanship duties, Mr. Harsh relinquished his responsibilities as general manager to D. C. McKee, vice-president and formerly assistant general manager.

D. C. McKee

These changes were dictated by the

# UPKEEP GOES DOWN with these UNDERGROUND CABLEWAYS

## These 5 advantages of TRANSITE DUCTS assure low maintenance

1. ***Permanently smooth bore***...long cable pulls and replacements are made easy. Danger of damage to cables is minimized.

2. ***Easily and quickly installed***...long, lightweight lengths and simple assembly method assure rapid, economical installation.

3. ***Inorganic***...made of asbestos and cement compressed under great pressure. This provides permanence and strength...makes these ducts immune to rust and rot.

4. ***Immune to electrolysis***...being entirely inorganic and non-metallic, Johns-Manville Transite Ducts are not affected by electrolysis or galvanic action.

5. ***Incombustible***...won't contribute to the formation of dangerous smoke, gases, or flames. If burnouts do occur, these inorganic ducts provide maximum protection to adjacent cables and permit easy removal of damaged conductor.

For complete details on J-M Transite Ducts, write for Data Book DS-410, Johns-Manville, 22 East 40th Street, New York, N. Y.

**TRANSITE KORDUCT** *above*—for installation in concrete. Thinner-walled but otherwise identical with Conduit.

**TRANSITE CONDUIT**—for exposed work and for use underground without a concrete encasement.

**Johns-Manville** **TRANSITE DUCTS**

Collyer
ASBESTOS
WIRE
LAUGHS AT HEAT • • •
COLLYER Asbestos Insulation, made of imperishable rock fibre, defies conditions that destroy other insulations. Improved non-toxic resin impregnating compounds and precise manufacturing give COLLYER Asbestos Insulation and Asbestos Varnished Cambric Insulation that extra quality which means unfailing service. Specify COLLYER Asbestos Wire—it resists heat, moisture and corrosive chemicals.
Available NOW in a wide range of constructions. Write for information.
Collyer
INSULATED WIRE CO.
257 ROOSEVELT AVENUE • PAWTUCKET, R. I.

fact that responsibility for operation of the company now rests upon the local board of directors, officers and department heads of the company, as a result of the utility's recent severance from the Cities Service Power & Light Co.

In addition to the above organization changes L. Bartlett, formerly electrical engineer with Electric Advisers, New York City, has recently become general superintendent of the Joplin utility in charge of all system operations.

•

## Wisconsin Utility Group Elects Montross Head

M. H. Montross, vice-president of Wisconsin Public Service Corp., Wausau, was recently elected president of the Wisconsin Utilities Association for the coming year. He succeeds S. R. Sherman, vice-president Wisconsin Gas & Electric Co., Racine.

M. H. Montross

Other officers elected include: Vice-President, B. E. Miller, manager rate and valuation department, Wisconsin Power & Light Co.; treasurer (re-elected), Alfred Gruhl, assistant research engineer, Wisconsin Electric Power Co.

•

▶ JOHN BISHOP, of Morganfield, Ky., has been appointed general manager of the Green River Rural Electric Cooperative.

▶ B. V. BOSARD, superintendent of distribution of the Southern Indiana Gas & Electric Co., Evansville, Ind., has retired after completing 41 years of service with the Indiana utility. Mr. Bosard began his career in the electrical industry in 1900 with a Chicago contractor and a year later became identified with the Springfield (Mo.) Gas & Light Co. In 1904 he joined what was then the Evansville Gas & Electric Co., prede-

# An Automatic Line Splice that holds fast — reduces work hazards — saves time

**Four-jaw serrated gripping unit of Fargo Splice holds solid and stranded wires in permanent, slip-proof grip.**

1. Whole jaw assembly is made from one piece of metal, so teeth automatically keep in alignment; the whole unit is stronger.

Four-jaw construction adjusts better to the contour of conductor; jaws grip from end of wire outward with pulling strain distributed along the wire—not located at one point.

Uniform height and spacing of teeth assures maximum conductivity and sure gripping.

2. Spring is made of phosphor bronze for long life and high fatigue point; exerts ample pressure to prevent the conductor from working out of the jaw when the splice is not under tension.

3. Stop plate made of heavy copper—prohibits wire from becoming tangled with spring.

4. Safety zone accommodates burred and upset wire ends.

## High conductivity—dependable service

All external and internal parts of the Fargo Line Splice are weather and corrosion resistant. This, with the other features of sturdy construction shown above, adds up to an Automatic Line Splice that holds fast — even under alternating tension and slack occasioned by whipping wind action.

**Thus, the Fargo Splice can be used over and over again.**

## Reduces working hazards

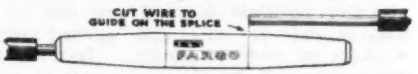
With no crimping tools needed to install the Fargo Automatic Line Splice, the safety factor is materially improved when working in dangerous high voltage zones. Even when working on dead lines, the lineman is less likely to be in danger if he needs no extra tools; has both hands free to make the splice.

## Simple, Quick Release

The Splice will hold the conductor in permanent, slip-proof grip, but it's simple to release the wire when necessary. Pushing in on the wire forces the jaws and spring back so that a screw driver can be inserted through the "disengage" slot. This holds the spring back and the jaws open so that the wire can be withdrawn.

## Saves time

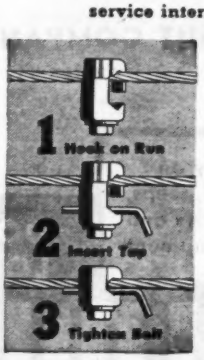
The features which make the Fargo Automatic Line Splice safer to use also reduce the amount of time needed to do the job. In addition, the Fargo Automatic Line Splice has guide lines around the body which designate where the ends of the conductor will be after the Splice is installed and tension applied. As a result, the lineman knows in advance how much sag the line will have when the wire ends are properly inserted in the Splice. It saves time in estimating the length to which the conductor should be cut. (See below.)




**Fargo Automatic Line Splices are made to handle wire sizes from 6 Solid to 4/0 Strand. Reducing Splices used to connect smaller wires to larger ones, are also available. See listing of Fargo products in Electrical Buyers Reference.**

**Every Fargo Automatic Line Splice is hand tested before it leaves the factory!**

**One-piece vise-type connectors save man hours—reduce service interruptions**




*Fargo solderless connectors are easy and safe to handle, permanently vibration-proof and produce high conductivity at contact point.*

*Fargo connectors available in sizes No. 8 to 1,000,000 CM*

"Grips like a vise"

(Approved by Underwriters Laboratories, Inc.)

# FARGO MFG. COMPANY

ESTABLISHED 1914

POUGHKEEPSIE, NEW YORK

Full Fargo Line Distributed by

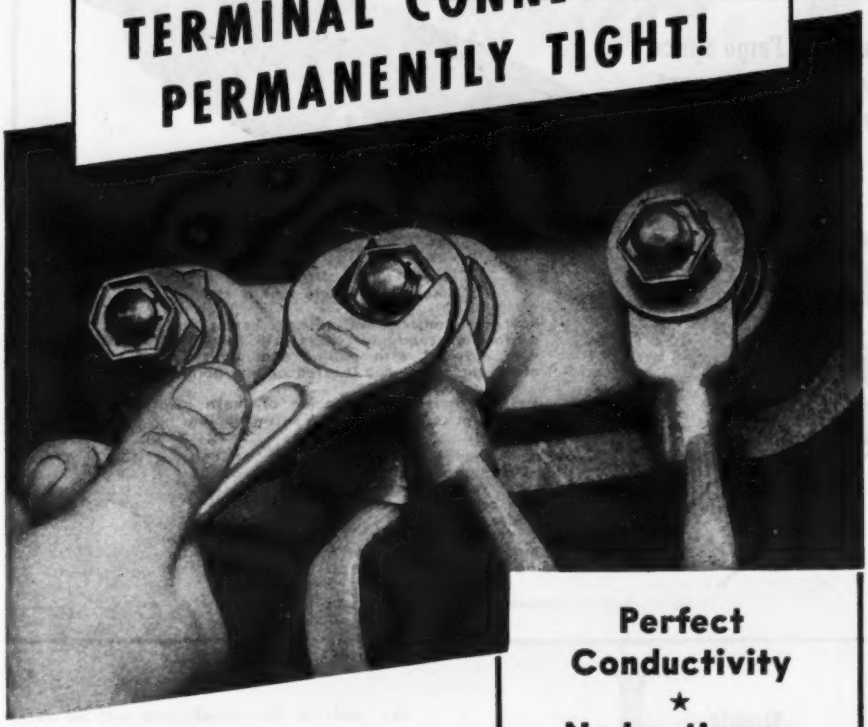
**LINE MATERIAL COMPANY**

Milwaukee, Wisconsin.

*(Representatives in principal cities)*

**SOLDERLESS CONNECTORS • LINE SPLICES • ELECTRICAL SPECIALTIES**

# PALNUTS KEEP TERMINAL CONNECTIONS PERMANENTLY TIGHT!



The big advantage of Double-locking Palnuts for terminal connections on transformers, switchboards, disconnects, etc., is this: *Palnuts apply on TOP of the regular nuts, holding them to original tightness.*

Spring washers are eliminated between nut and terminal lug. There can be no backing off of nuts and opened spring washers to reduce contact. Instead, full conductivity of the entire nut seat is maintained under severest vibration.

Double-locking Palnuts are single thread locknuts, made of tempered spring steel or Duronze. They are easily, quickly spun on with the fingers and locked with 1/3 turn of a wrench. Require only 3 bolt threads space, are light in weight, low in cost, may be re-used.

Specify Palnuts on equipment you buy—use them on equipment you build or service. Available from stock for every utility requirement. Write for Palnut Manual No. 1, giving engineering data.

**THE PALNUT COMPANY**
**51 Cordier St., Irvington 11, N. J.**

**Perfect Conductivity**
★
**No heating or corroding of contact surfaces**
★
**Easy, speedy assembly**

## *Double Locking Action*

When the Palnut is tightened, its arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt threads and downward on the regular nut (A-A), securely locking both.

**Used Today on Aircraft, Tanks, Jeeps, Military Vehicles and other War Equipment**

DOUBLE-LOCKING
**PALNUTS**

cessor of Southern Indiana Gas & Electric Co. It was in 1912 that he was made superintendent of distribution.

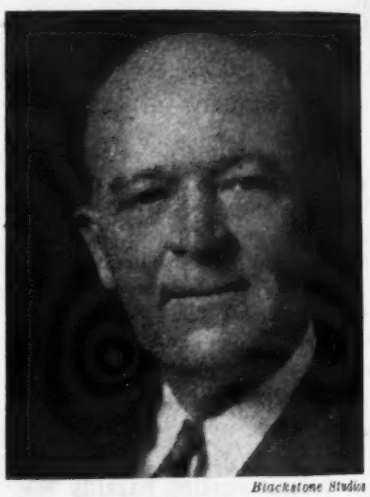
H. B. PARRIS, secretary and treasurer of the Dallas Power & Light Co. since 1933, has been appointed vice-president and treasurer of the company. The appointment follows a long career in the electric utility industry, which began in 1914 when Mr. Parris joined the Dallas Electric Lighting & Power Co.

•

## C. E. Stephens Retires As Westinghouse Executive

C. E. Stephens, vice-president of the Westinghouse Electric Corp., has retired from active service with that company after 45 years of service. During a large part of this time he has been an outstanding leader in the electrical industry with a broad acquaintance in many allied fields.

Mr. Stephens became identified with the Westinghouse company as an apprentice in 1900 and after several years as an engineering student, he entered



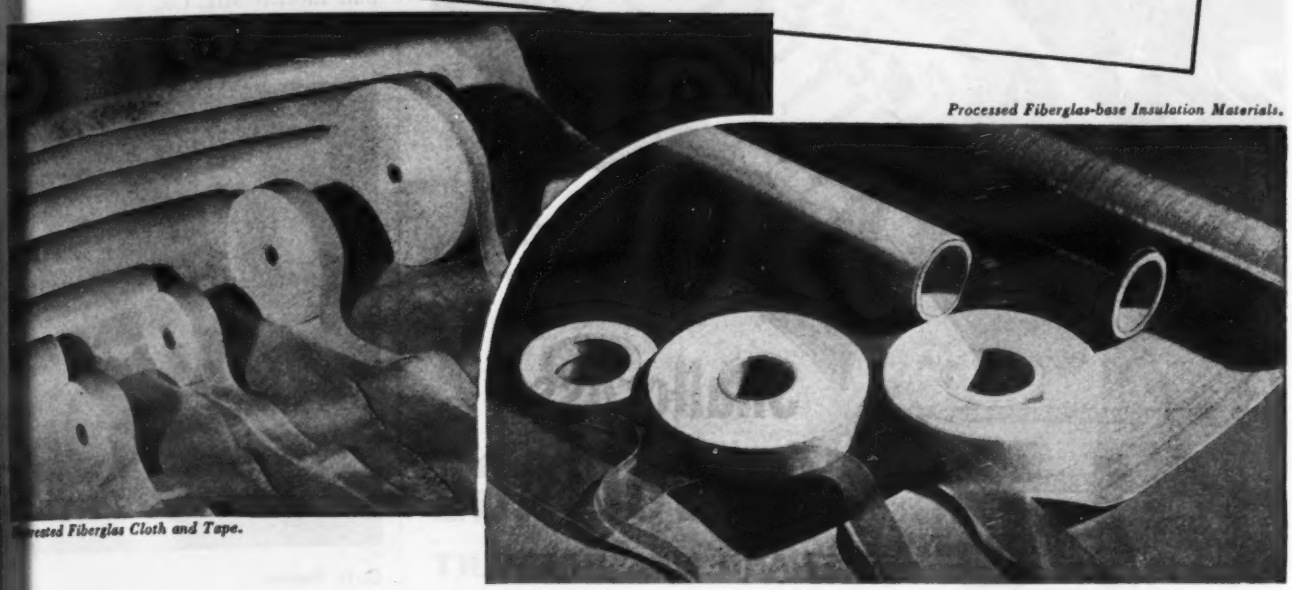
*Blackstone Studios*

the engineering department where he worked on the development of motors.

After a relatively short time on this work he was made manager of the arc lighting section of the engineering department and later manager of the illumination section of the sales department. In 1917 he was transferred to the New York office as manager of the supply department. Later he was appointed manager of the central station division of the New York Office and in 1925 manager of the New York district. In 1930 he was elected commercial vice-president in charge of the districts in the Atlantic Division and two years later was elected vice-president of the company.

Mr. Stephens served for four years as a director of the American Institute of Electrical Engineers and represented A.I.E.E. on the executive committee of

# WHY DO PROCESSORS MAKE *so many kinds* OF FIBERGLAS* INSULATION MATERIALS?



*Processed Fiberglas-base Insulation Materials.*

*Processed Fiberglas Cloth and Tape.*

Designers and manufacturers of innumerable types of electrical equipment recognized the unexcelled advantages which Fiberglas offers as a base for insulation materials. Fiberglas—glass in fiber form, woven into textiles—provides a thin, strong, flexible base for insulating impregnants.

Many electrical engineers saw ways in which Fiberglas insulation materials could solve problems which no other insulation material could solve. Manufacturers recognized it as a means of providing an additional safety factor for their products.

To meet these specifications and the demand for better insulation materials, processors and insulation manufacturers developed a wide range of Fiberglas-base materials. So that, today, there is a Fiberglas Electrical Insulation Material available to meet virtually every insulation need such as:

***Fiberglas-insulated Wire and Cable*** ... Most wire manufacturers are currently manufacturing Fiberglas-insulated wire of many different types for a wide range of applications—magnet wire, single and double covered; lead wire; radio hook-up wire; aircraft ignition cable; neon sign cable; thermocouple wire; communication cables; and wires for special purposes.

***Fiberglas Varnished Cloth and Tape*** ... Made by many manufacturers who impregnate various types of Fiberglas Cloth, in several thicknesses, with several kinds of varnishes specially developed to meet normal or extreme conditions. These products are available in 36″ widths or cut to any desired tape width.

***Fiberglas-Mica Combinations***...The combination of thin, strong glass cloths with mica for ground insulation is not dependent upon impregnating varnish for its electrical characteristics. The mica splittings provide dielectric strength while Fiberglas gives it a tough, stable inorganic backing.

***Fiberglas Laminates*** ...Most manufacturers of electrical laminates make one or more types of Fiberglas-base materials, which are used for panels; in motors and generators as slot sticks; armature or stator end punchings; brush holders; space blocks, etc. Also, Fiberglas-base laminates, having low electrical losses at high frequencies and high humidity, are finding increasingly wide use in radio, radar and other electronic applications.

***Write for booklet*** . . . EL 44-7, tells what type to use, where and how. Send for your copy today, ask for the name of the Fiberglas Electrical Insulation Materials supplier located nearest to you. *Owens-Corning Fiberglas Corporation, 1858 Nicholas Building, Toledo 1, Ohio.*

*In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.*

**Each Distributor of Fiberglas-base Insulation Materials has his own source of supply; some of these processed insulations is made by Owens-Corning Fiberglas Corporation**

ARMY E NAVY

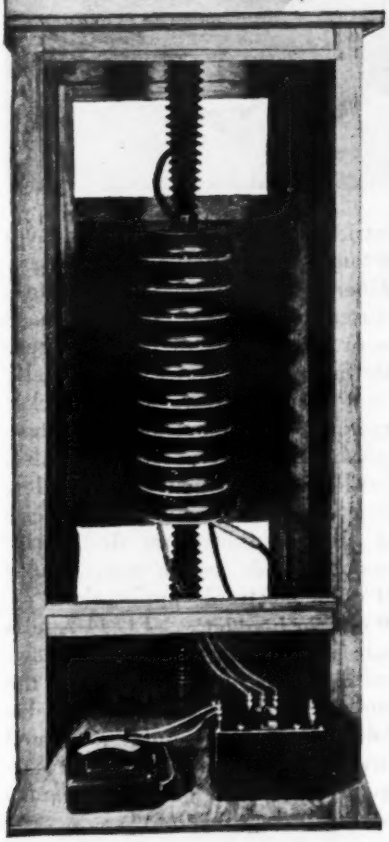
# FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

***ELECTRICAL INSULATION MATERIALS***

Typical of the larger portable Shallcross Kilovoltmeters, No. 722 is rated 2-20 KV. d-c, 1000 ohms per volt.

Interior view of Kilovoltmeter Multiplier No. 712-5-3. 12 kv., 5 ma., 2.4 megohms.



A special Shallcross Corona Protected Kilovoltmeter with front shielding wire screen removed to show interior. Meters illustrated are optional.

# Shallcross
# HIGH VOLTAGE
## TEST AND MEASUREMENT
# EQUIPMENT

If your requirements call for standard kilovoltmeters or kilovoltmeter multipliers in any one of many sizes and voltage ranges or for specially designed high voltage equipment, Shallcross offers the services of its High Voltage Engineering Section. Backed with many years of experience in this field, Shallcross engineers welcome the opportunity to help in the solution of practically any high voltage test or measurement problem.

## WRITE FOR BULLETIN

Bulletin "F", recently released, includes detailed descriptions of standard Kilovoltmeters, Kilovoltmeter Multipliers, and Corona Protected Resistors and serves as a guide to the many special types that can be produced to match particular requirements in a range of potentials from 1 to 200 kilovolts.

**SHALLCROSS MFG. CO.**

**DEPT. EW 55, COLLINGDALE, PA.**

ENGINEERING • DESIGNING • MANUFACTURING


the American Engineering Council. He served as a member of the U. S. National Committee of the World Power Conference and is a past-president of the Electrical Association of New York.

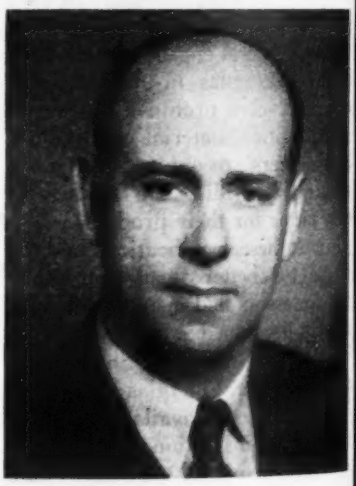
•

## Trumbull Appoints New Pacific Coast Officers

Carroll D. Hepler has been appointed president of the Pacific Division, Trumbull Electric Mfg. Co., with factories at Seattle, Washington and Los Angeles, Calif. Mr. Hepler will be located at the

C. D. Hepler

Seattle plant. Alfred G. vonNormann, formerly manager of the Los Angeles plant, has been elected vice-president. William E. Froude will act as secretary-treasurer. In his new position, Mr. Hepler succeeds John H. Trumbull former governor of Connecticut, who retired



A. G. vonNormann

last January. No change has been made in the organization of the Trumbull Electric Mfg. Co., Inc., with headquarters factory at San Francisco.

Mr. Hepler started to work for the A. G. Manufacturing Co. in 1921 and continued as a part time employee while studying electrical engineering at the

# Baffles check erosion of heater tubes

TUBES were failing in a horizontal chemical heater after three years of service, yet similar tubes in a vertical heater showed no corrosion after 13 years. Steam enters the top of the shell at one end under 38 lbs. pressure and is removed as condensate at the bottom near the opposite end. Caustic flows through the tubes. Failures were occurring in the first 18 inches from the tube sheet where caustic enters and maximum condensation of steam occurs.

Sections of the tubes were submitted to Scovill and subjected to examination. Little scale or corrosion was found, on either surface, but the outside surfaces showed uniform thinning along their lengths. Wall thickness was reduced approximately .005" to .01".

### MISSING FILM LEADS TO CAUSE

Scovill traced this thinning of the walls to erosion, caused by impinging steam and condensate. This erosion was of sufficient magnitude to destroy the protective films, exposing clean metal surfaces to progressive corrosion by condensate and gases. Scovill suggested an alternative in the arrangement of baffles to minimize erosive action on the tube surfaces. This change was made and tube life was improved. The tube material has excellent resistance to corrosion by caustic and also to corrosion by steam and condensate, so no change in tube alloy was required.

### OTHER SCOVILL SERVICES

In addition to *Service in Men* — consisting of consultation on tube problems and installation methods, Scovill offers two other services. *Service in Metals* covers the selection of alloys and study of specific problems in field and laboratory. *Service in Manuals* offers literature on condenser and heat exchanger tubes. For a copy of the booklet *Scovill Condenser Tubes*, address Scovill Manufacturing Company, 24 Mill Street, Waterbury 91, Connecticut.

Scovill
MANUFACTURING COMPANY
WATERBURY 91, CONN.

CONDENSER TUBES
ONE PRODUCT . . . THREE SERVICES
*Service in Manuals . . . Service in Metals . . . Service in Men*

# Long-Span Construction Cuts Rural Line Costs

Savings of $100 to $120 per mile have been reported where *Crapo* Steel Conductors have been used in long-span rural distribution lines. These savings will be an important consideration in the rural power expansion program which lies ahead.

*Crapo* Steel Conductors are especially applicable to the tap and branch lines which make up a substantial part of the rural mileage yet to be built. These ferrous conductors, with their relatively low 60-cycle resistance and reactance, will carry the voltages and loads ordinarily imposed on typical rural extensions with a voltage drop well within prescribed limits.

$I^2R$ losses on rural lines built of *Crapo* Steel Conductors are so small as to be negligible especially when compared with the potential overall savings. The high rugged strength of these conductors makes possible extra long spans, reduces the number of pole structures per mile, cuts material and labor costs, minimizes maintenance.

**Complete Technical Information**

Investigate the practical economy of *Crapo* Steel Conductors for your post-war rural program! Ask a representative of Graybar Electric Company, Inc., Distributor, or write direct for a copy of our Engineering Manual!

**INDIANA STEEL & WIRE COMPANY**
**MUNCIE, INDIANA**

**Crapo HTC-130 STEEL CONDUCTORS**


University of Washington until 192[illegible] when he went on a full-time basis. When Trumbull purchased the A. G. organization in 1929 he was made Seattle manager for Trumbull. Mr. Hepler was elected vice-president and general manager, Trumbull Electric Mfg. Co., Pacific Division, in 1933, the position he held until his election to the presidency.

Following graduation from the University of Washington, Mr. vonNorman spent two years in the test course at General Electric in Schenectady. It was in 1922 that he became identified with the Trumbull organization in the Seattle plant, advancing later to chief engineer, the position he held until 1933. At that time he was promoted to manager of the Los Angeles plant.

## OBITUARY

### Philip G. Gossler

Philip G. Gossler, chairman of the board of the Columbia Gas & Electric Corp., and an outstanding figure in the public utility industry for a number of years, died on May 18 in Doctors Hospital, New York, after a brief illness. He was 74 years of age.

From 1909 to 1922 Mr. Gossler was

chairman of the board of the Columbia Gas & Electric Co., which was the nucleus of the Columbia System, developed under Mr. Gossler's leadership, and from 1922-26 he served as chairman and president. Upon the formation of the Columbia Gas & Electric Corp. in 1926 through the merger of the Ohio Fuel Corp. and the Columbia Gas & Electric Co., he was made president of the new organization, the position he relinquished in 1936 to assume the chairmanship of the board.

A native of Columbia, Pa., and a graduate of Penn State College, Mr. Gossler was assistant engineer with the United Electric Light & Power Co., New York,

# AWAY AHEAD!

## TOBE LEADS IN NOISE ELIMINATION

# NEW SCREEN BOOTH FILTER

HERE is more evidence of Tobe's Leadership in the noise elimination field. This remarkable SCREEN BOOTH FILTER is designed for use in laboratory testing rooms, including those already shielded to prevent outside electrical interference. It is attached to the power line at the point of entrance into the booth, and is designed to eliminate troublesome interference which might upset vital testing work. *Note the exceptional frequency range,* from .15 MC to 400 MC.

**CONTAINER DIMENSIONS**

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| Length . . | 20 1/16" | Height . . | 4 1/8" |
| Width . . | 7 15/16" | Weight . . | 35 lbs. |

Whenever your problem is connected with eliminating electrical interference, the name to remember is . . . TOBE! We have a great inventory of knowledge on this subject, backed by 17 years' experience. Your inquiries are welcome at any of our offices. Investigate the applications you can make of TOBE Filters, including the unusual SCREEN BOOTH FILTER described on this page.

**TOBE DEUTSCHMANN CORP., CANTON, MASS.**

SUPPRESS MAN-MADE RADIO STATIC
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## "We won't see that conduit again for a long time —its Orangeburg!"

FOR over 50 years Orangeburg Conduit has been demonstrating its ability to give permanent, low-maintenance service—with this four-fold protection:

**1. Protection from ground water infiltration** . . . because of tight taper sleeve joints and impermeable walls.

**2. Protection from cable sheath abrasion** . . . because of its smooth bore Orangeburg reduces the danger of damage to the sheath when the cable is pulled into the duct.

**3. Protection from cable sheath corrosion** . . . because the composition of Orangeburg guards the cable along the line of contact between sheath and duct, where corrosion often occurs.

**4. Protection with cable movement** . . . because the smooth, surface of Orangeburg reduces abrasion as the cable expands and contracts with changing loads.

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**WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.**


from 1891 to 1895 and then went to Montreal where he was at first superintendent and engineer with the Royal Electric Co. for six years and then general superintendent and engineer with the Montreal Light, Heat & Power Co. for three more. Returning to the United States, he served as vice-president of J. G. White & Co. and various other companies until 1909.

Mr. Gossler was a trustee of the Edison Electric Institute, a past-president of the Canadian Electrical Association, a past-vice-president of the Edison Pioneers and the New York Electrical Society and a member of the American Institute of Electrical Engineers, Association of Edison Illuminating Companies and the American Gas Association.

•

▶ ARTHUR J. SWEET, well-known in the field of illuminating engineering, died on April 7. At the time of his death, Mr. Sweet was working with the Civil Aeronautics Administration, Washington, D. C., and had developed in that organization an airport lighting system which it is believed, will make possible landings when visibility is as low as 230 feet. In his work as an independent consulting engineer and also as an engineer employed at different times by the Westinghouse Electric Corp. and the Holophane Co., Mr. Sweet was responsible for many original ideas and important lighting installations. The phase of lighting development for which Mr. Sweet is perhaps best known is that of street and highway lighting. His attempt to determine the fundamental engineering considerations involved in obtaining good street lighting carried him into extensive research, the results of which he presented before the Franklin Institute in a paper entitled "An Analysis of Illumination Requirements in Street Lighting" in 1910.

▶ GEORGE C. BARNEY, of the operation and engineering department of the American Telephone & Telegraph Co., died at Orange Memorial Hospital, East Orange, N. J., on May 11 after a short illness. At the time of his death he was engaged in work on the coordinated construction of joint power and telephone lines.

▶ CARL F. HANSON, since 1930 chief consulting engineer for the Irvington (N. J.) Varnish & Insulator Co., died on April 27 at his home in Westfield, N. J., at the age of 61. Mr. Hanson was born in Kansas and received his engineering education at the University of Kansas. He was formerly with the Bureau of Standards in Washington. Mr. Hanson was a member of the American Institute of Electrical Engineers.

# Good Start for a Power Transformer

*Operator at Allis-Chalmers' Pittsburgh plant applying Natvar varnished cambric to form the insulating barrier between core and low voltage winding of a Power Transformer. Multiple strand conductor is used for compactness and for maximum reduction of eddy current losses.*

ALLIS-CHALMERS Power Transformers are designed and built for continuity of operation with minimum of maintenance.

In spite of increased industrial loads demanded by the war effort, these transformers have operated far beyond their rated capacity for extended periods without interruption, without other than routine maintenance. *That's performance!*

It is a source of considerable satisfaction to us that Natvar insulating materials, because of their high uniformity, were selected for this important application.

What are your requirements? Write, wire or phone us for deliveries — either from the stock of a wholesaler near you — or direct from our own.

Natvar

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
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- Varnished Fiberglas cloth
- Varnished papers
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# MANUFACTURING MARKETS

## Expansion Planned by Johns-Manville

Johns-Manville Corp. has no large reconversion problem, but will be faced with heavy expenditures for new equipment, such as labor-saving machinery, new research facilities and improvements in existing output methods when the war ends. Lewis H. Brown, president, informed stockholders at their recent annual meeting.

"We shall need to buy equipment to make new products and to improve existing products," Mr. Brown said, "and we shall need to redesign much of our present equipment in order to achieve lower production costs, since present labor costs are apparently going to remain. We also expect to resume a war-interrupted program for improving working conditions.

"It is not expected that the company's deferred expenditure fund, together with depreciation reserves, will cover this combined expense, so we are counting on our regular earnings to assist in this expansion," he stated.

•

## Impulse Generator Tests Speeded at Sharon Plant

A 3,600-kv. impulse generator has been installed in the production aisle of the Westinghouse Electric Corp. transformer plant at Sharon, Pa. so that power transformers can be given a streamlined impulse test. All transformers 501 kva. and above, except those for specialized services such as furnace transformers, power regulators, rectifier transformers, receive this test.

•

## Yarnall-Waring Film

A new 16 mm. Kodachrome and sound motion picture has just been released by the Yarnall-Waring Co., Chestnut Hill, Philadelphia, for showing before technical societies, trade groups, engineering schools and engineers and operating men in industry. The purpose of the film is three-fold: (1) To show the engineering reason behind every Yarway product; (2) to show typical applications of the products in the many industries where they are used and (3) to show the manufacture of Yarnall products, the care and precision that are built into each one.

•

## Industry Told to Consider White Enamel Substitutes

Because of the great shortage of rosin, the lighting fixture industry has been advised to investigate possible substitutes for white enamel such as porcelain enamel, aluminum, or diffusing plastics or glass.

In giving this advice, the Building Materials Division of the War Production Board pointed out that the rosin shortage is due to the scarcity of labor in the woods and that even if the war should be over in both Europe and the Pacific in 1945 no relief can be expected before 1946 as the rosin season runs from April to September.

## Manufacturers Issue Earnings Reports

Among the electrical manufacturing companies that have recently issued earnings reports are the following:

AMERICAN TRANSFORMER—For 1944, net income, $42,339, or 77 cents a share, compared with $115,623, or $2.10 a share in 1943.

CONTINENTAL DIAMOND FIBRE—Including wholly owned domestic subsidiaries, March quarter, net income $106,593, compared with $83,878 last year; total sales, $3,302,402, against $3,036,462.

ANACONDA WIRE & CABLE—March quarter (preliminary), net profit, $273,062, or 61 cents a share compared with $325,291, or 77 cents a share last year.

MCGRAW-ELECTRIC—Twelve months to March 31, net profit, $837,626, or $1.77 a share on net sales of $10,635,822, compared with $1,026,082, or $2.17 a share on sales of $10,157,521, for twelve months to March 31, 1944.

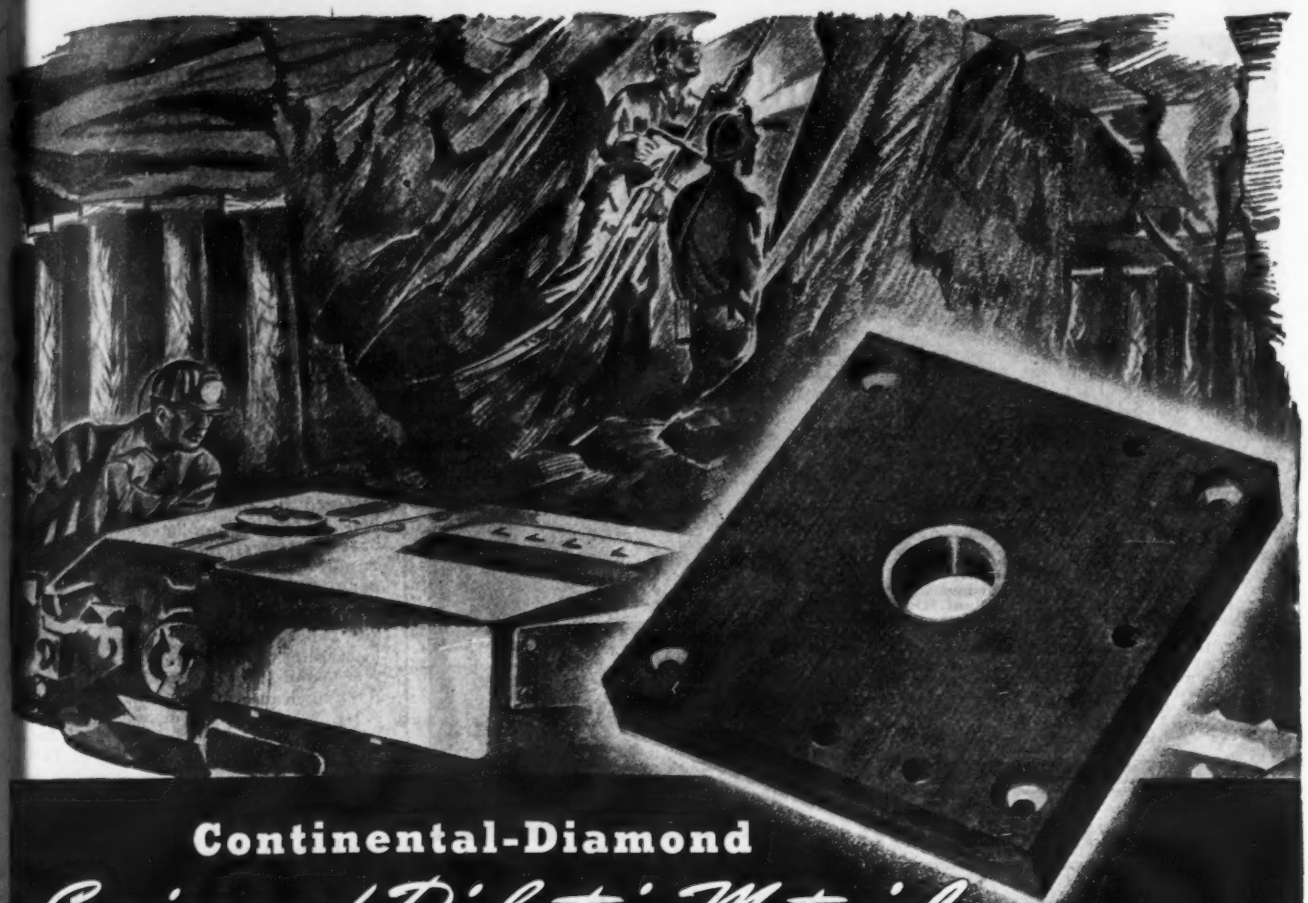
WESTON ELECTRICAL INSTRUMENT—For quarter ended March 31, net income, $116,996, or 73 cents a share; for similar 1944 quarter, net income, $137,076, or 85 cents a share.

•

## G.E. Orders Rise Slightly

Orders received by the General Electric Co. during the first quarter of 1945 amounted to $395,466,000 compared with $391,901,000 for the corresponding period of 1944, an increase of one per cent, President Charles E. Wilson recently announced.

**ON WAY TO ENGLAND—Harold W. Martin, seated second from right, is honored by members of Work Simplification Society, of which he is president, at a dinner in Boston previous to his departure for London to join the staff of Stevenson, Jordan, and Harrison, Ltd., management engineers. Mr. Martin, English by birth and an electrical engineering graduate of Manchester College of Technology, has been engineer at the Boston works of Allis-Chalmers Manufacturing Co.**



# Continental-Diamond
# *Engineered Dielectric Materials*

The electrical controller base plate illustrated had to be made from an electrical insulating material that would resist carbon deposit from arcs . . . that would be unaffected by the moisture in mine air . . . that would be strong enough on which to mount current carrying parts . . . C-D VULCOID was the answer.

EM-45

## C-D PRODUCTS

**The Plastics**

**DILECTO**—A Laminated Phenolic.
**CELORON**—A Molded Phenolic.
**DILECTENE**—A Pure Resin Plastic Especially Suited to U-H-F Insulation.
**HAVEG**—Plastic Chemical Equipment, Pipe, Valves and Fittings.

**The NON-Metallics**

**DIAMOND Vulcanized FIBRE**
**VULCOID**—Resin Impregnated Vulcanized Fibre.
**MICABOND**—Built-Up Mica Electrical Insulation.

**Standard and Special Forms**

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

**Descriptive Literature**

Bulletin GF gives Comprehensive Data on all C-D Products. Individual Catalogs are also Available.

C-D VULCOID is an insulating material which provides a combination of the desirable properties of both laminated phenolic plastics and vulcanized fibre. It is a result of C-D research and is an exclusive C-D product. It well illustrates the ability of C-D to engineer Dielectric materials to meet specific problems. Fifty years of manufacturing experience, plus research and practical experience in solving customer's problems enables C-D technicians to come up with the right answer to "What Material?" problems. Avail yourself of this service.

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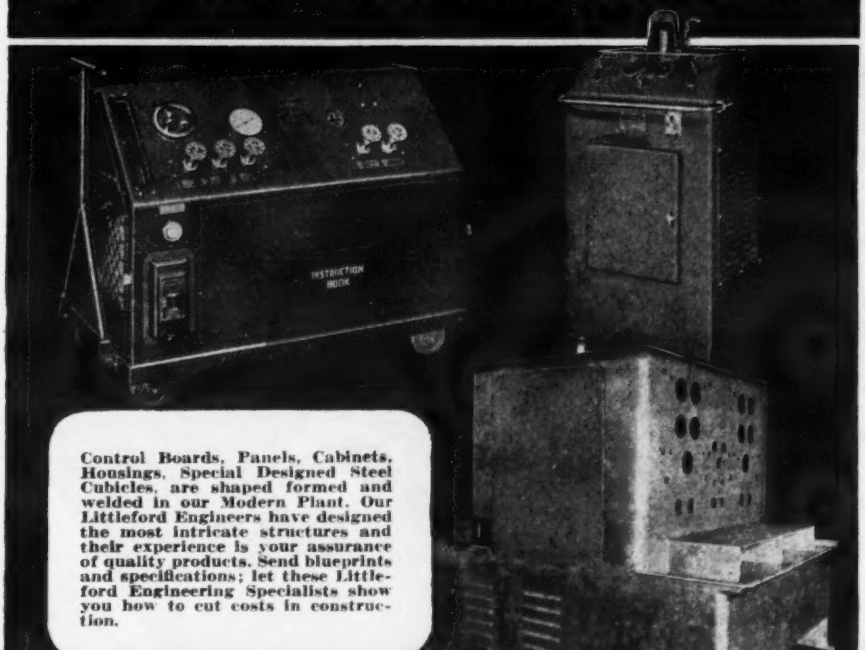
# INSTRUMENT MOUNTING STRUCTURES



Control Boards, Panels, Cabinets, Housings, Special Designed Steel Cubicles, are shaped formed and welded in our Modern Plant. Our Littleford Engineers have designed the most intricate structures and their experience is your assurance of quality products. Send blueprints and specifications; let these Littleford Engineering Specialists show you how to cut costs in construction.

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# TRICO OILERS

PROTECT BEARINGS
INCREASE PRODUCTION
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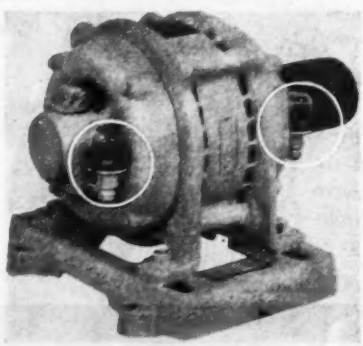
Actual performance records prove that better machine performance, improved maintenance and lower operating costs result when TRICO OILERS are installed.

Bearing failures—guesswork—needless shutdowns for hand-oiling—damaged materials and accident hazards are eliminated.



This 5 HP 1800 r.p.m. motor is modernized with TRICO OPTOMATIC constant level OILERS.

Modernize your equipment TODAY and you will always look with pride to your TRICO OILER installation.

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giving complete information on all types available. There's a size and style for every application.

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## Manufacturers Make Sales Assignments

Among recent sales appointments by electrical manufacturing companies are the following:

GRAYBAR ELECTRIC CO. has named P. V. Black district operating manager in the Pacific District with headquarters in Los Angeles.

OLIVER IRON & STEEL CORP., Pittsburgh, Pa., has appointed A. L. Perdue northern California district representative. Mr. Perdue was formerly lighting specialist in San Fransicso for the Westinghouse Electric Supply Co. In his new position, he will have charge of all activities involving the complete list of pole line hardware manufactured by the company. He has established his office at 260 Fifth St., district headquarters of the Westinghouse Electric Supply Co., distributors for the Oliver company in that area.

BUCKEYE LABORATORIES CORP., Cleveland, has appointed two new representatives: J. F. Collins, Statler Building, Boston 16, Mass., and J. E. Murray & Co., 1805 Grand Avenue, Kansas City 8, Mo.

PROGRESSIVE WELDER CO., Detroit, has announced that Walter Pestrak and Paul L. Duer, both identified with resistance welding for many years, have formed the Duer Engineering Co., a partnership, to represent Progressive in eastern Ohio and western Pennsylvania. Mr. Duer has been associated with Progressive Welder Co. as field sales engineer for several years. Before joining Duer, Mr. Pestrak was senior welding engineer of the Federal Machine & Welder Co. Duer Engineering Co. will maintain offices at 1015 Mahoning Bank Bldg., Youngstown 3, Ohio.

•

## Electric Storage Battery Orders Increase in '45

Orders received by the Electric Storage Battery Co., Philadelphia, for the first quarter of 1945 amounted to $33,000,000, as compared with $18,000,000 in the first quarter of 1944. R. C. Norberg, president, announced at the recent annual meeting of stockholders. Shipments for the first quarter of this year were $20,285,000 against $19,383,000 a year ago. The consolidated backlog of unfilled orders as of April 1 amounted to $49,325,000, as compared with $39,000,000 as of April 1, 1944.

"Reconversion should not present too serious a problem," Mr. Norberg stated. "The company will be ready to turn out its usual peacetime product, in full volume, as fast as war contracts are completed."

•

## Johns-Manville Dividend

Johns Manville Corp. has declared a 75-cent dividend on the common stock for payment on June 8. The previous payment was 50 cents on March 12 this year.

# Field Reports on Business

*Reports indicate that utilities are making plans for extensive line extensions. Much store modernization is under way with the accompanying demand for lighting equipment and wiring supplies. Applications for new dwellings, to be built as soon as materials are available, are numerous.*

## NEW YORK

The effects of the termination of the war in Europe were immediate in the steel industry as definite cutbacks in war programs appeared. Order volume dropped sharply from the high levels which had been maintained since the first of the year.

Civil engineering construction volume in the Continental United States totaled $29,049,000 last week, according to *Engineering News-Record*. This volume was 25 percent lower than in the preceding week but exceeded the volume for the corresponding 1944 week by 8 percent. Public work for the week was down 26 percent compared with a week ago, but topped a year ago by 93 percent as a result of the 92 percent gain in federal volume. Private work was 56 and 64 percent lower, respectively, than the week ago and a year ago. The week's construction brought 1945 volume to $629,121,000 for the twenty-week period, 11 percent below the corresponding period of last year.

The volume of corporate financing for the month of April aggregated $665,918,603, and with the exception of October 1944, was the largest monthly total since May, 1930, when $927,376,218 was reported.

Retail trade in the Metropolitan area was active last week, with consumers showing little tendency to caution as a result of the ending of the European war.

## NEW ENGLAND

A 115-kv. wooden pole line is expected to be completed by fall between the Tewksbury (Mass.) substation of the New England Power system and Nashua, N. H., to form a connecting link between the New England utility and Public Service Co. of New Hampshire. Boston & Albany R. R. officials have announced that $500,000 will be expended for improvement and modernization of its waterfront properties and negotiations are under way by Raytheon Mfg. Co., Waltham, Mass., to lease a site on Prospect Hill for a television station. United Aircraft Corp., East Hartford, Conn., has received an allotment totaling $800,000 from the DFC for expansion of its facilities and the purchase of new machinery for its Stratford, Conn., plant.

It looks as though the textile industry may lead the race to convert its production facilities to peace-time operations. Inquiries for small motors are very active; mill engineers in both the Rhode Island and Massachusetts textile sections are busy on plans for quick changes. Building permits for new construction and store modernization in Greater Boston are increasing and lighting sales are advancing. A new telephone toll cable will shortly be completed between New London and New Haven, (Conn.) for the Southern New England Telephone Co.

American Bosch Corp., Springfield, Mass., has received an order for magnetos and parts totaling $812,412 from the Navy. Connecticut companies continue to receive large Navy orders for bearings, and some electrical specialties, brushes, wiring devices, and small lots of wire and cable are moving at a good rate. The Boston office of FHA has processed 1320 applications for new dwellings in the Boston area which are to be built as soon as materials are available. Construction at Army and Navy stations in this district is going on at a moderate pace.

## CHICAGO

With the rate of delivery of post-war electric appliances depending on the availability of manpower and materials, Edison General Electric Appliance Co. expects only a trickle of appliances will reach the market in the first months after production is resumed. However, within a year after production starts output should equal that of 1942, it is said.

First appliances to reach dealers will be electric ranges, water heaters and dish washers, on which production can be started within 90 days of the release of restrictions. Other appliances, such as refrigerators, where conversion is a problem, will require six to eight months before first appliances come off the line. Commercial cooking equipment, in production for the Army and Navy during the war will be available as soon as limitations are relaxed, according to a company spokesman. Present government orders sanction the manufacture and post-war models on all major electric appliances for demonstration purposes. Indications are that manpower, rather than materials, will be the greatest handicap to speed restoration of full production, it was indicated.

Sales of government surplus goods is being watched carefully by manufacturers in this area for indications of its effect upon post-war markets. Sales of surplus government good by the U. S. Department of Commerce offices in the Chicago area in April totaled only $254,755, the agency reported this week. Total sales throughout the country by the Department of Commerce were reported as $4,889,784.

## PACIFIC COAST

Sierra snow level averages under 20 inches at 6,000 feet, though a good irrigation year is assured. Much line extension work is reported, with sizable orders for poles, crossarms, hardware, and stock sizes of distribution transformers. Three 28-ton diesel electric locomotives have been shipped to Hawaiian Islands, and Fairbanks-Morse have purchased a group of three 50 hp. motors, costing $30,000. Pacific Gas & Electric Co. is to build a 60-kv. line extension near Oroville, Calif., costing $100,000. Preliminary field work is progressing on Southern California Edison's 220 kv. transmission line from Boulder Dam, to cost $4,500,000 and to be ready by late fall.

Typical industrial developments include a $400,000 grain elevator at Worden, Ore.; a sugar beet plant at Toppenish, Wash.; an ore mill for Kellogg, Ida.; a glass factory at Antioch, Calif., for Fiberboard Products Co. and a $3,000,000 addition to Union Oil at Wilmington, Calif.

New major government construction covers a $1,609,513 award for naval electrical material redistribution center at Torrance and $4,620,000 for disciplinary barracks at Camp Cooke, Santa Maria.


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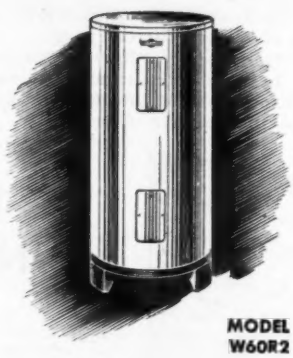

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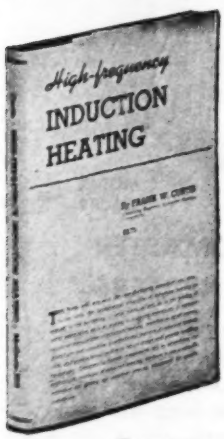


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# Sales Opportunities

INDIANA—Studebaker Corp., South Bend, plans new two and six-story addition to automobile body plant, about 224 by 634 ft., for production for government, with machinery and electrical equipment. Cost estimated close to $5,000,000. Bids have been asked on general erection contract and award will be made at early date. Giffels & Vallet, Marquette Building, Detroit, Mich., are architects and engineers.

MINNESOTA—City Council, Chisholm, has approved an ordinance granting electric light and power franchise to a new cooperative organization now being formed, headed by John J. Dwyer, Duluth, which proposes to construct and operate a new steam-electric generating station for this purpose, including electrical distribution system. Franchise also covers central steam heating service of downtown district, with installation of underground pipe line system for distribution. Project will be carried out as a post-war development, or as soon as equipment and materials are available. Frank L. Paskvan, city clerk, has detailed information regarding program.

CALIFORNIA—San Diego Gas & Electric Co., San Diego, plans extensions in transmission line, about 27 miles. Also new distribution line for increased power supply. Priority rating has been secured and work will begin soon. Cost estimated about $198,000.

WASHINGTON—Boeing Aircraft Co., 7755 East Marginal Way, Seattle, will make extensions in branch plant for production for government, including additional buildings with machinery and electrical equipment for considerable increased capacity. Cost estimated about $800,000, with financing by Defense Plant Corporation. Work is scheduled to begin soon.

WISCONSIN—Algoma Plywood & Veneer Co., Algoma, has approved plans for new power house at mill, to be used at present time for steam supply for plant, installation to include three 500-hp. boilers and auxiliary equipment. At later date, plant will be converted for electric service, with installation of a 750-kw. turbine-generator unit, water-softening equipment and other facilities. Present plant, for which priority rating has been secured, will cost about $210,000.

MINNESOTA—Village Council, Elk River, plans early call for bids for new municipal distribution system for electric light and power service. Project will be carried out as a post-war development. Toltz, King & Day, Inc., Pioneer Bldg., St. Paul, is consulting engineer.

NEW YORK—Durez Plastics & Chemicals, Inc., Walck Rd., North Tonwanda, plans four large one-story plant additions on 27-acre tract of land adjoining present factory, with machinery and electrical equipment. Cost estimated close to $3,000,000. Project will be carried out as a post-war development, or as soon as materials and equipment are available. Harry D. Dent is president.

TEXAS—Public Works Department, Barstow, plans post-war expansion and improvement program at municipal airport, including installation of lighting system, with underground and overhead feeder lines, controls, and auxiliary equipment. Fund of about $286,000 is being arranged for entire project.

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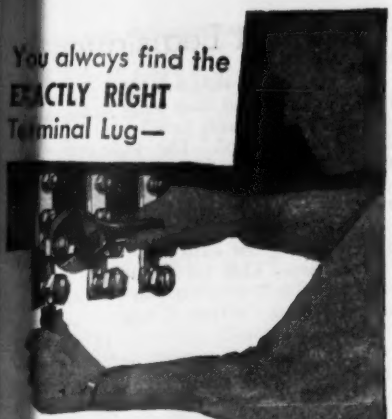

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NORTH CAROLINA—Bureau of Aeronautics, Navy Department, Washington, D. C., plans one-story addition to assembling and repair shop at Naval Air Station, to cost about $400,000, with machinery and electrical equipment. Also new hangar, to cost about $710,000, and extension to engine overhaul and engine test building, estimated at $357,000, with mechanical and electrical equipment and facilities. Appropriations in amuont noted are being arranged in budget for federal fiscal year beginning July 1. Bureau of Yards and Docks, Navy Department, Washington, will be in charge.

WYOMING — Department of Interior, Washington, D. C., has issued report approving construction of new hydroelectric generating station about 3 miles downstream from Shoshone dam. Heart Mountain district. Plant will be equipped for initial capacity of 5,000-kw., and is estimated to cost about $900,000. Project will include transmission line to oilfields in that area, for power supply for drilling and pumping operations. When appropriation has been arranged, program will be carried out under direction of Bureau of Reclamation, Denver, Colo.

CONNECTICUT—United Aircraft Corp., 400 Main St., East Hartford, will make extensions in airplane plant for production for government, including additional buildings, with machinery and electrical equipment. Cost estimated at $800,000. Financing by Defense Plant Corporation. Proposed to begin work soon.

OHIO—Electric Light Department, East Palestine, is considering preliminary plans for expansion and improvements in municipal steam-electric power plant, including installation of new turbine-generator and auxiliary equipment. Cost estimated close to $200,000. It is understood that application will be made for a priority rating.

WISCONSIN—Water Department, Winneconne, has plans maturing for extensions in municipal waterworks, including installation of motor-driven pumping machinery, controls and auxiliary equipment. Entire project will cost about $110,000. McMahon Engineering Co., Menasha, is consulting engineer.

WASHINGTON—Bonneville Power Administration, Portland, Ore., plans extensions in transmission and distribution system in Grays Harbor-Olympia-Bremerton district. including new high-tension line estimated to cost $431,800; new transmission lines about $300,000, $227,700 and $166,700. Program wil include extensions in power substation to cost approximately $86,800, with transformers, switchgear and auxiliary equipment; new power substation estimated at $255,000, with equipment; and new substation $97,300. Proposed to arrange appropriations in amounts noted in budget for federal fiscal year beginning July 1.

WASHINGTON—Owens-Illinois Glass Co., Ohio Bldg., Toledo, Ohio, has made application for priority rating for new glass bottle and container plant comprising group of 14 buildings, to cost approximately $3,500,000, with mechanical and electrical equipment. A power plant will be built.

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## Noma Buys Plastics Unit

Noma Electric Corp. has purchased the Connecticut Valley Plastics Corp., of Holyoke, Mass., Henri Sadacca, president of Noma, has announced.

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## Recent Legislation

FLORIDA—Two different bills to put utility companies and their rates under supervision of state boards have been defeated by House committees. The Public Utilities Committee gave a 15 to 3 unfavorable report to the bill setting up a new agency to do the rate-making. The same group voted 14 to 2 against a bill to put the regulation under an expanded state railroad commission. This latter bill was also defeated by a 7 to 2 vote of the Railroads and Common Carriers Committee to which it had been jointly referred. The first bill would have set up a seven-member utilities board and would have covered all utility operations without exempting municipally-owned plants and rural electrification projects. It was introduced by Representative Archie Clement. The second bill, introduced by Representatives Goodwin M. Nilsson and Mary Baker, would have changed the name of the Railroad Commission to the Florida Public Service Commission, given it five members instead of the present three and would have exempted city plants and REA projects from its control.

NEBRASKA—The Legislature has passed and the governor signed a bill giving cities and villages with public power districts credit for paying their proportionate share of the bonded indebtedness of the districts. It provides that when a city or village acquires its electric distribution system from a public power district by condemnation, the city's proportionate share of the district's bonded debt, paid off while the city was part of the district, shall be deducted from the price paid for the distribution system. It also provides that when all of a city's proportionate share of the bonded indebtedness is paid the distribution system, upon request, will be given to the city without cost.

OKLAHOMA—A measure passed by the Legislature establishes an Electrical Administrative Board of the State and requires certain standards for electrical equipment, materials and installations. The statute also provides appointment of a chief electrical inspector and deputy electrical inspector and a board of five members, including the fire marshall, whose duty will include arranging for examinations of applicants for license and for issuing permits for the privilege of doing electrical work in the state.

PENNSYLVANIA—Little legislation affecting the light and power industry was enacted at the biennial session of the Legislature, which adjourned on May 7, although numerous measures were introduced. One bill enacted provided that assessments for street lighting in townships based on frontage of affected areas replace a tax based on assessed valuations of such properties. This legislation was necessitated by a Supreme Court decision. Lost through dropping from the House calendar in the last-week rush for adjournment was a Senate bill which would have required Public Utility Commission approval of incorporation of rural cooperatives. A variety of bills were introduced in both House and Senate to make real estate of public service companies subject to taxation. Few of these emerged from committee. The one exception, defeated on final passage in the House, was a House bill of Representative Fleming which dealt with taxation in second class cities. It would have amended the measure authorizing such cities to "levy and collect taxes for general revenue purposes, real and personal and mixed property . . . for city and county purposes except machinery of all kinds" by adding at this point "and on all real estate owned or possessed

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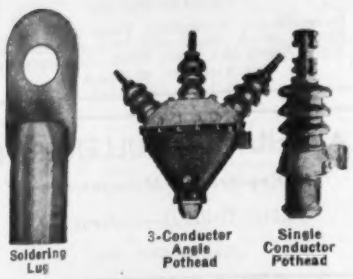


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RHODE ISLAND—Prior to the recent adjournment of the Rhode Island Legislature two municipal ownership bills died in committee. One provided that any city or town could acquire or maintain its own electric plant, and originated in Woonsocket. This bill failed to pass at two previous sessions. The other, a bill authorizing the city of Newport to acquire the plant and business of the Newport Electric Corp. at a future popular election, was on the docket for the first time this year. Little evidence of public support developed.

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## Recent Rate Action

OHIO EDISON CO.'s offer of a $150,000 annual reduction in commercial lighting rates in Youngstown, Ohio, and a $146,000 cut in city street lighting costs, in return for a one-year extension of the present residential electric rate ordinance and a 12-year extension of the utility's basic franchise for operating in the city is being considered by City Council. Present street lighting contract between the city and the utility is not cancellable until January 1, 1946, but the Ohio Edison is willing to enter into a new one, officials indicated. The offer is identical with reductions recently accepted by the Akron City Council, said Samuel Stites, Ohio Edison district manager. The proposed new street lighting contract would cover a five-year period and could be extended by mutual agreement year by year thereafter for an additional five years. The city would pay only $28,850 this year for street lighting, saving $146,000. The street lighting rate would be cut about 10 percent from the present rate after this year. Commercial lighting rates, under the proposed new contract, would be cut 9.7 percent. The present commercial rate ordinance is cancellable June 1, 1947, while the basic operating franchise extends until November 11, 1957.

SOUTH CAROLINA ELECTRIC & GAS CO.'s rate charges in Columbia were criticized by Mayor Fred D. Marshall, who stated that present plans include a hearing before the state Public Service Commission at an early date, at which time Attorney Clint T. Graydon of Columbia will ask for a decrease in utility rates on behalf of the city. Mayor Marshall had previously asked the General Gas & Electric Co., parent of the South Carolina utility, for a rate reduction of 20 percent (ELECTRICAL WORLD, February 17, page 182) which was refused. The Mayor said at that time that if the request were not granted the next step by the city would be an appeal to the state commission.

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**SW-843, Electrical World**
**520 North Michigan Ave., Chicago 11, Ill**

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P-865, Electrical World
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Good starting salary and excellent opportunity for advancement. Write at once giving complete details of education and past experience. Personal interview will be arranged.

P-857, Electrical World
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WANTED

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P-875, Electrical World
330 West 42nd St., New York 18, N. Y.

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P-873 Electrical World
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P-874, Electrical World
330 W. 42nd St., New York 18, N. Y.

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P-876, Electrical World, 520 North Michigan Ave., Chicago 11, Ill.

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P-878, Electrical World,
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1—200 HP, 690 RPM, 440 volt, Crocker Wheeler slip ring
1—200 HP, 600 RPM, 2200 volt G.E., sl. rg.
1—200 HP, 450 RPM, 2300/4000 v. G.E. sl. rg.
1—150 HP, 1800 RPM, 440 volts, G.E. sq. cg.
2—150 HP, 1200 RPM, Westinghouse, squirrel cage
2—150 HP, 1800 RPM, 220 volt, Westinghouse slip ring
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1—250 HP, 700 RPM, Electro Dynamic.
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1—100 HP, 625 RPM, G.E.
1— 80 HP, Crocker-Wheeler, 600 RPM.
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1—30 HP, 400/1200 RPM, General Electric.
2—25 HP, 650/2200 RPM, Westinghouse.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—15 HP, 300/1200 RPM, General Electric.
1—12/18 HP, 250/1200 RPM, Electro Dynamic.
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2—400 KVA, G.E. 4156-240/480 v. Scott taps.
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3—150 KVA, G.E., 33,000 2300/4000 Y.
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1—225 KVA, 514 RPM, 600 volt, Westinghouse.
1—200 KVA, 3600 RPM, 250 volt, Allis-Chalmers.
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1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—30 KW, 125 volt, Allis Chalmers.

### ENGINE GENERATOR SETS

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**Rotary Converters—3 Ph. 25 Cy.**

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|---|---|---|---|---|
| 2—1500 | G.E. | 500 | 225/275 | 6600 |
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| 1—1500 | G.E. | 360 | 250 | 2300/4600 |
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| 1— 500 | G.E. | 720 | 600 | 13200 |
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**★ These companies have supplied additional buying information on their products in the 1945 edition of the Electrical Buyers' Reference**

# AIR SWITCHGEAR . . . *is a Natural*

The present-day swing to *air* switchgear is of particular interest and considerable satisfaction to I-T-E. For 57 years we have steadfastly maintained that *air* is the natural, the only self-restoring and the best medium in which to break an arc.

Industry's universal acceptance of the air-break principle is no mere matter of chance. Year after year we have been designing and building bigger and better air circuit breakers, and we have done it irrespective of the claims and clamor of intensive competition. In fact, modern switchgear practice is what I-T-E ingenuity, skill and effort have made it. Today, there is not a breaker requirement, regardless of interrupting capacity, that can not be fully met with an I-T-E air-break design. We have the facts and will be glad to present them to you.

*Representatives in all principal cities*

SWITCHGEAR

BUS STRUCTURES

UNIT SUBSTATIONS

HIGH SPEED
CIRCUIT BREAKERS

AUTOMATIC RECLOSING
CIRCUIT BREAKERS

**I-T-E**

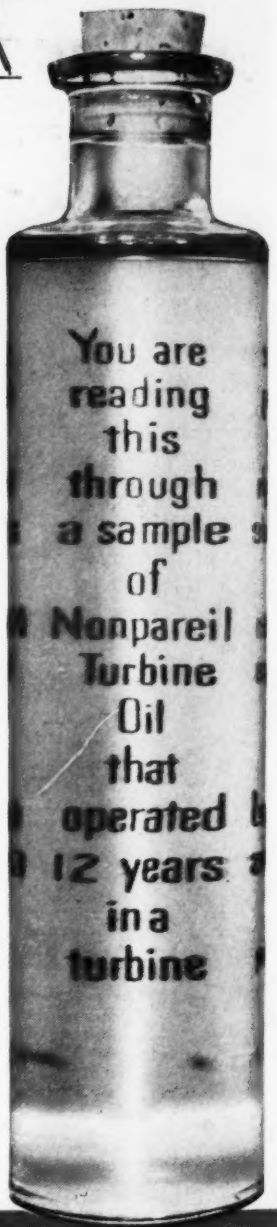
## AIR SWITCHGEAR

**I-T-E CIRCUIT BREAKER CO.**

**19th and Hamilton Streets Philadelphia 30, Pa.**

# There is a message for you in this turbine oil sample

A life-size unretouched photograph




Of course, the picture doesn't tell the whole story, so here are the facts.

The sample illustrated is from a fill of oil installed in a 5000 kw. turbine, June, 1933. Since then, the turbine has operated regularly, yet this fill of oil—

- has never been removed from the turbine oil system for treating or resting.
- has only been filtered through a bag-type filter.
- has shown no sign of rust or corrosion.
- has Tag-Robinson color of 16.
- has the extremely low neutralization number of .04 mg. KOH/gm.
- has an indefinite period of the same clean, acid-free operation ahead—it is guaranteed for the life of the turbine.

Compare this record with the time, trouble and expense of maintaining a fill of oil for 12 years in your plant. Compare also the years of guaranteed satisfaction still available in this fill of Nonpareil Turbine Oil. Wouldn't it pay you to change to Nonpareil Turbine Oil now?

A Standard Oil Lubrication Engineer will be glad to answer any questions you have about Nonpareil Turbine Oil. Call the local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois.

*Buy more War Bonds*

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**TURBINE OIL**

**STANDARD OIL COMPANY (INDIANA)** STANDARD SERVICE

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